AUGUST 27, 1960

Chemical Week

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▲ CW Report: The New Force at Herc

Foreign trade roundup: CW reports industry views on U.S.'s import-export balance . p. 37

Wet-process phosphoric –changing technology shifts fertilizer geography . . . . . p. 69

Anodic corrosion control goes commercial; but industry reaction is cool . . . . . p. 91

Welcome mat's out for research centers in Fairfield County, Connecticut . . . . p. 97

Quiet boom in sound-proofing specialties fused by leaded plas- [illegible] p. 121

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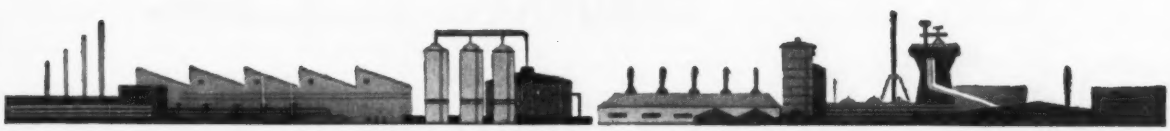
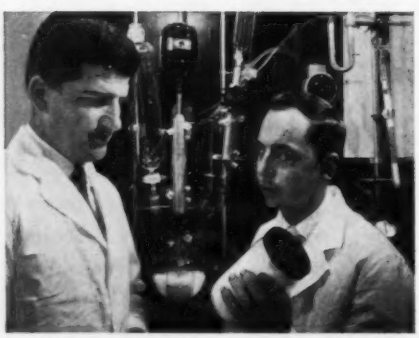


More and more new uses for borax have their beginnings at Anaheim...



The scientists shown here are representative of the large staff of research chemists who daily probe new frontiers of boron chemistry at the Anaheim Research Center. These men were a part of the teams which introduced two new boron compounds to the chemical industrial world last year.

New uses for borax, new concepts of boron chemistry, and new boron compounds, born of the imagination and specialized skills centered here, hold a promise of better things for you. You've seen the advent of tough new ceramics and metals... fiber glass... durable, heat-resistant glassware... nuclear power plants. Borax is vital to each of them! But that's not all. Today you find borax toughening steel and softening leather; growing crops and killing weeds; improving gasoline, boosting the cleansing action of soaps and detergents, flameproofing paints, fighting forest fires... and doing scores of other worthwhile chores for you.

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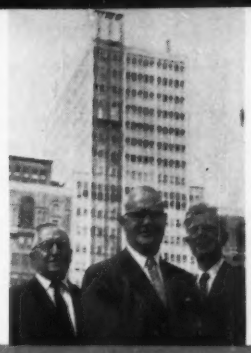

ON THE COVER: The new, 22-story Hercules office building in Wilmington, Del., opened Aug. 1, forms the background for this photo of Hercules President Al Forster (center) and former board chairmen Charles Higgins (left) and Anson Nixon.

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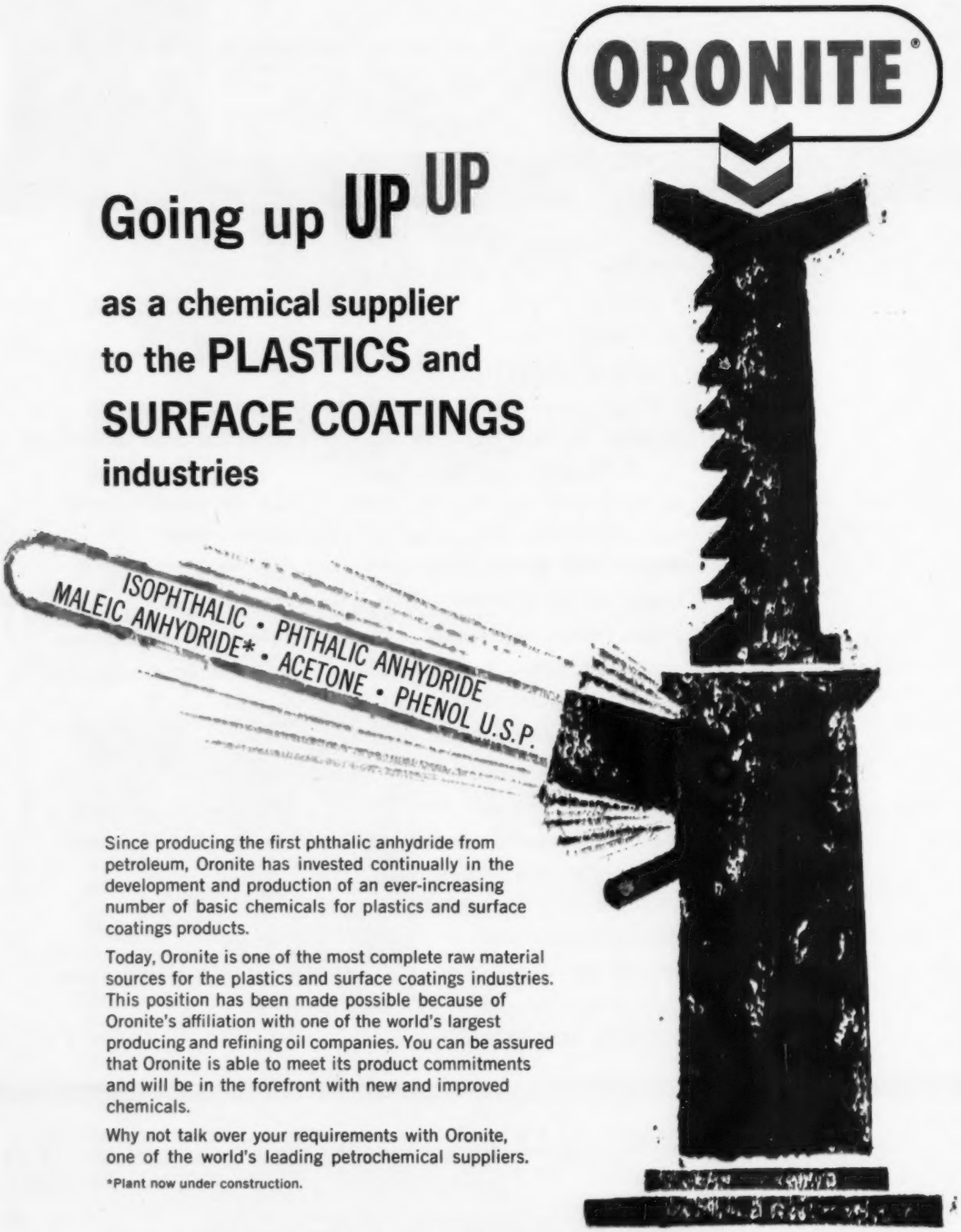

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Target: Rising Cost of Research

NOT ONLY ARE RESEARCH COSTS RISING, but they are also increasing as a percentage of sales. This trend, if unchecked, could exert a significant upward pressure on chemical prices.

A new study bears out the seriousness of the situation. In '53 research on chemical and allied products amounted to 1.9% of sales, according to Yale Brozen, professor at the Graduate School of Business of the University of Chicago. By '56 the figure was 2.3%. Furthermore, Brozen expects no immediate decline in chemical research and development spending relative to sales.

There's some—but not much—comfort in knowing that the rest of U.S. industry is in the same boat. Brozen sees the portion of gross national product devoted to R&D rising from 1.9% to 3% in the next 15 years, with an ultimate ceiling of 5% in the next century.

Industrial R&D leaped from $3.6 billion in '53 to $8.2 billion in '58, according to recent National Science Foundation data. About $1.24 billion will be spent by the chemical process industries, alone, this year on R&D.

Brozen notes that the profitability of research, which has accounted for the rapid growth of R&D spending in the past, is now diminishing "This is one of the reasons for expecting a less rapid R&D growth in the future," Brozen observes.

Another study, by A. Neil McLeod, staff economist of The Institute of Paper Chemistry (Appleton, Wis.), shows that for 30 selected paper companies R&D expenditure as a percentage of sales rose from 0.44% in '49 to 0.65% in '59. McLeod observes, "It has become a mark of corporate virtue to have R&D, as a percent of sales, high and rising. Isn't this a strange concept? Isn't profit the only item on the operating statement that we want to see increasing as a percent of sales? You do no appraise sales effectiveness by the cost of sales but rather by sales results."

Granted that the big problem is getting the most for the research dollar, How is it to be done? Dow Chemical Co. Vice President Carl Gerstacker recently pointed out (at the American Institute of Chemical Engineers meeting in Mexico City) that research on new products in the chemical industry is threatened by rising costs and static chemical prices. But Dow, whose research within the last five years accounted for slightly more than 10% of its total sales in fiscal '60, isn't just waiting for rising prices to provide additional revenue for research. It is making its research more efficient.

The firm's annual report, out this week, proudly notes that 24 new products were launched during the year—the largest number ever to qualify in one year. It further observes that the average time for a product to travel from laboratory to market was reduced to four years. In '57 this average time was eight years.

"This reduction," says Dow, "has been accomplished through pointing the research organization toward better selection of projects, more effective use of facilities, including pilot plants, computers and automatic data-taking equipment, and more effective communications among all segments of the company involved in bringing a product to market."

Dow's experience teaches an important lesson. Unless CPI companies aggressively make the most of time- and laborsaving devices and strive for more efficient researchers (*CW, Aug. 6, p. 66*), they face soaring—and, in time, prohibitive—research outlays.

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LETTERS

Bears and Chemicals

TO THE EDITOR: During a visit to Yellowstone National Park recently I encountered two things of interest to the chemical industry.

The first item is the tremendous opportunity available—to someone with the courage to carry out the testing program—to develop an effective bear-repellant. Such a product would make camping in the parks of the U.S.A. and Canada much more attractive, not to mention more relaxing, than it now is. Possibly a deodorant (from the bear point of view) for garbage cans would be effective.

The other item had to do with a lecture given by a park ranger one evening titled "Civilization — Skin Deep." I expected to hear some sort of nature talk, and it was, but heavily diluted by clap-trap on the wonders of "natural" this and "natural" that as opposed to the terrible consequences of "chemical" fertilizers, insecticides, etc. The ranger remarked that the insecticides kill the insects and poison us a bit too and cause cancer, upset the balance of nature, etc. I thought it a strange thing for a federal employee to be paid to do; I assume he was not talking to us on his own time.

F. J. L. MILLER
430 Forrest Dr.
Trail, B. C.

No Foreign Control

TO THE EDITOR: On page 140 of the June 18 issue of CHEMICAL WEEK, in the paragraph headed "England," it is stated that this company is foreign controlled.

This is incorrect, since Reichhold Chemicals Ltd. is essentially a British public company with very little foreign shareholding. . . .

G. S. BACHE
Joint Managing Director
Reichhold Chemicals Ltd.
London

Not the First

TO THE EDITOR: In the Market Newsletter section of your Aug. 13 (and also Aug. 20) issue it is reported that industrial rayon "initiated" a 2½¢ lb. reduction in the price of tire cord.

In the interest of accuracy, I should like to point out that Industrial Rayon was not the first to reduce prices, and respectfully refer you to our news release of Aug. 1, which notes that our price reduction "follows similar action by other viscose tire yarn producers."

GEORGE I. ROUNDS
Vice-President
Marketing
Industrial Rayon Corp.
Cleveland

MEETINGS

Gordon Research Conference at Colby Junior College, New London, N.H.—Aug. 29-Sept. 2, cancer.

Gordon Research Conference at New Hampton School, New Hampton, N.H.—Aug. 29-Sept. 2, adhesion.

Gordon Research Conference at Kimball Union Academy, Meriden, N.H.—Aug. 29-Sept. 2, high-temperature chemistry: kinetics of vaporization and condensation processes.

Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, Mass., Sept. 7-9.

American Chemical Society, National meeting, New York, Sept. 11-16.

Synthetic Organic Chemical Manufacturers Assn., meeting, Roosevelt Hotel, New York, Sept. 13.

Chemical Exposition U.S.A. 1960, Sept 13-15, Hotel Statler Hilton, New York. Exposition held concurrently with 138th national meeting of the American Chemical Society. Admission to exhibits free to industry representatives.

Drug, Chemical & Allied Trades Assn., 70th annual meeting, Sagamore Hotel, Bolton Landing, Lake George, N.Y., Sept. 15-18.

Chemical Market Research Assn.; theme: "The European Chemical Industry"; Wentworth-by-the-Sea, Portsmouth, N.H., Sept. 22-23.

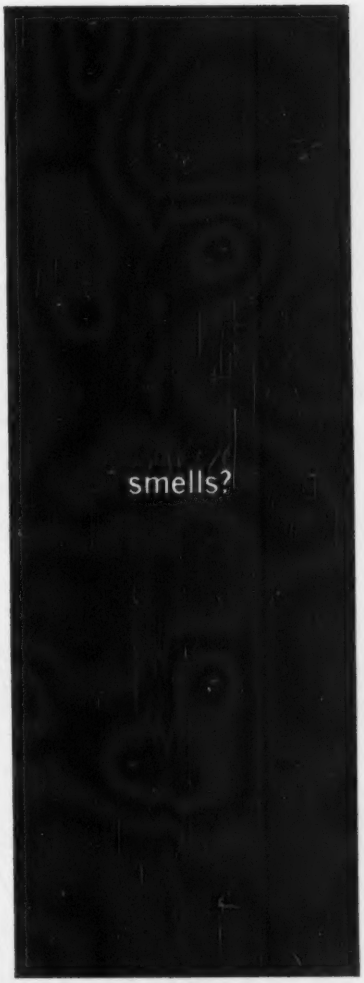
American Assn. of Textile Chemists & Colorists, 1960 national convention, Sheraton Hotel, Philadelphia, Pa., Oct. 6-8.

International Plastics Congress, Amsterdam, Holland, Oct. 10-12.

Synthetic Organic Chemical Manufacturers Assn., meeting, Roosevelt Hotel, New York, Oct. 11.

The Magnesium Assn., 16th annual convention, Pick-Carter Hotel, Cleveland, Oct. 17-19.

Building Research Institute, 1960 fall conferences, sessions on "preassembled components" and "structural foams," Nov. 15-17, Shoreham Hotel, Washington, D.C.



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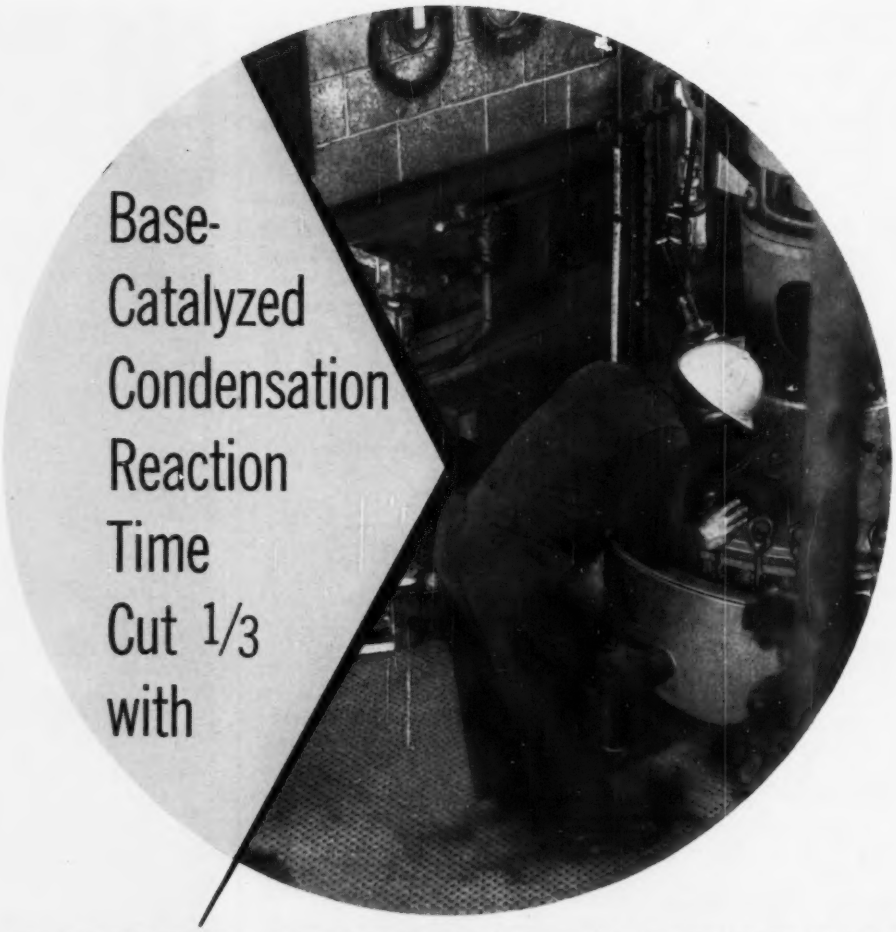

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Keto-Ester Condensations

$$R\text{-}\overset{O}{\overset{\|}{C}}\text{-}OR' + C_6H_5\text{-}\overset{O}{\overset{\|}{C}}\text{-}CH_3 + 2\ NaH \rightarrow \left[C_6H_5\text{-}\overset{O}{\overset{\|}{C}}\text{-}CH\text{-}\overset{O}{\overset{\|}{C}}\text{-}R\right]^{\ominus} Na^{\oplus} + NaOR' + 2H_2$$

Alkylation of amides

$$R\text{-}\overset{O}{\overset{\|}{C}}\text{-}NHR' \xrightarrow{NaH} \left[R\text{-}\overset{O}{\overset{\|}{C}}\text{-}NR'\right]^{\ominus} Na^{\oplus} \xrightarrow{R''X} R\text{-}\overset{O}{\overset{\|}{C}}\text{-}N\begin{matrix}R'\\R''\end{matrix}$$

*Carbethoxylation of Cyclohexanone

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CURRENT INFORMATION ON LITHIUM CHEMISTRY AND METALLURGY

LITHIUM METAL AND LITHIUM COMPOUNDS IN FUEL-CELL DEVELOPMENTS

The need for new low-weight, high-efficiency power sources for both military and civil uses has stimulated much research on devices which can convert conventional energy sources, either chemical or thermal, directly into electrical energy, without the use of a heat engine. A fuel cell is such a device.

Much effort has been directed to fuel cells based on the oxidation of hydrogen. A recent news release reports substantial progress with such a cell employing an ion-exchange membrane. To meet the low-weight requirement, the hydrogen would be supplied by the reaction of water on a metal hydride, rather than by compressed hydrogen gas. Lithium hydride may serve here as a convenient, low-weight hydrogen source.

Development of a different type of fuel cell employing lithium has also been in the news. This is a regenerative cell in which electrical energy is obtained by the combination of lithium and hydrogen to form lithium hydride, with an electrolyte comprised of molten lithium halides. The reaction products are removed from the cell into a decomposition chamber where the application of thermal energy regenerates lithium and hydrogen, which can then be recycled. This type of cell has obvious uses in space vehicles in which the thermal energy is obtained from a nuclear reaction.

Analysis and Stability of n-Butyllithium

An important problem which has long plagued many chemists is a suitable method for the determination of the stability of organolithium compounds. The recent adoption of n-butyllithium as a polymerization catalyst for synthetic "natural" rubber has increased the need for accurate means of analysis. A recent paper from LCA Research Labs, by Kamienski and Esmay, discusses one analytical procedure. Copies are available from the Technical Service Dept.

United States Borax Marketing LCA Products to Ceramics, Glass

Lithium Corporation of America, Inc., and United States Borax and Chemical Corporation have announced the establishment of a cooperative arrangement for the promotion and sale of lithium compounds in the United States and certain adjacent foreign markets by the appointment of U. S. Borax as sales agent. The agreement covers the sale of lithium compounds used by the ceramic and glass industries, and the joint promotion and development of other industrial uses for lithium, the announcement stated. Company spokesmen said that a significant increase in the use of lithium compounds is anticipated through the additional broad sales coverage of industry afforded by the U. S. Borax marketing organization and the cooperative sales and market development efforts of both companies.

U. S. Borax is the world's leading producer of boron chemicals and Lithium Corporation of America is a prominent producer of lithium carbonate and many other lithium compounds. Both lithium and boron compounds are now extensively used in the ceramic and glass industries, spokesmen said.

LITHIUM IN BRIEF

A recent U. S. Patent discloses a lithium containing porcelain enamel composition for aluminum which is free from lead, fluorine, zinc, cadmium, alkaline earths and alumina. (2137).

A dimethylformamide solution of lithium chloride is used for the dehydrobromination of steroids and related compounds as a means of introducing a carbon-carbon double bond. Further work might extend this reaction to other types of compounds. (2254-2255).

Lithium periodate ($LiIO_6$) can be prepared by the reaction of lithium iodide and oxygen above 140°C. Analogous reactions do not occur with other alkali iodides. (1955).

The preparation of amines by reacting lithium alkyls or aryls with solutions of chloramine (NH_2Cl) will be a useful tool in synthetic organic chemistry. (2417).

Organic lithium compounds are more effective than conventional Grignards for the preparation of substituted pyridines. Yields of 2-sec-butylpyridine prepared both ways are compared in a recent publication. (2762).

Lithium chloride has been evaluated as one electrolyte in beating tests of kraft wood pulps with valley beater. (2781).

A summary of various methods for the preparation of lithium aluminum hydride has been compiled. (2651).

Lithium 9/10 hydroxystearate greases were investigated by the Air Force and the properties recently published. (2673).

The catalytic behavior of Li alkyls as polymerization initiators is discussed in a recent paper. Cation complexes and certain reaction mechanisms are included. (2704).

For further information, write our Technical Service Department, Bessemer City, N. C.

New Lithium Bibliography Available

The 7th supplement of the "Annotated Bibliography on the Use of Organolithium Compounds in Organic Synthesis" is now available from Lithium Corporation of America. It contains 487 references with subject and author indices. Copies ($2.00 each) may be ordered from our Technical Service Department in Bessemer City, N. C.

LCA MOVES HOME OFFICE

Effective June 15th, the executive and sales offices of LCA were moved to 500 Fifth Avenue, New York 36, N. Y. The former Minneapolis office will be closed and all sales correspondence should be addressed to the New York office.

The Technical Service Department is now located in Bessemer City, N. C.

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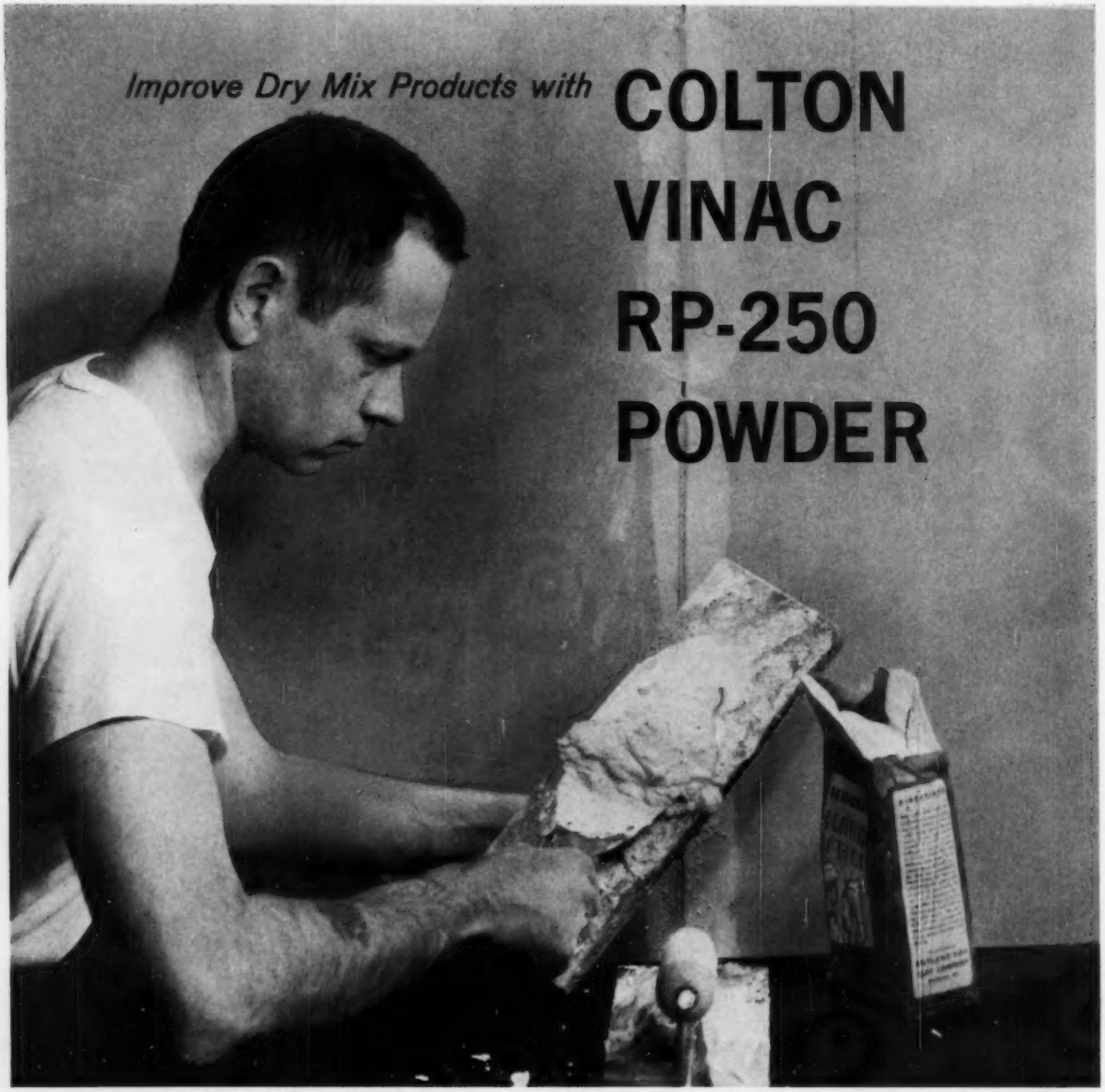

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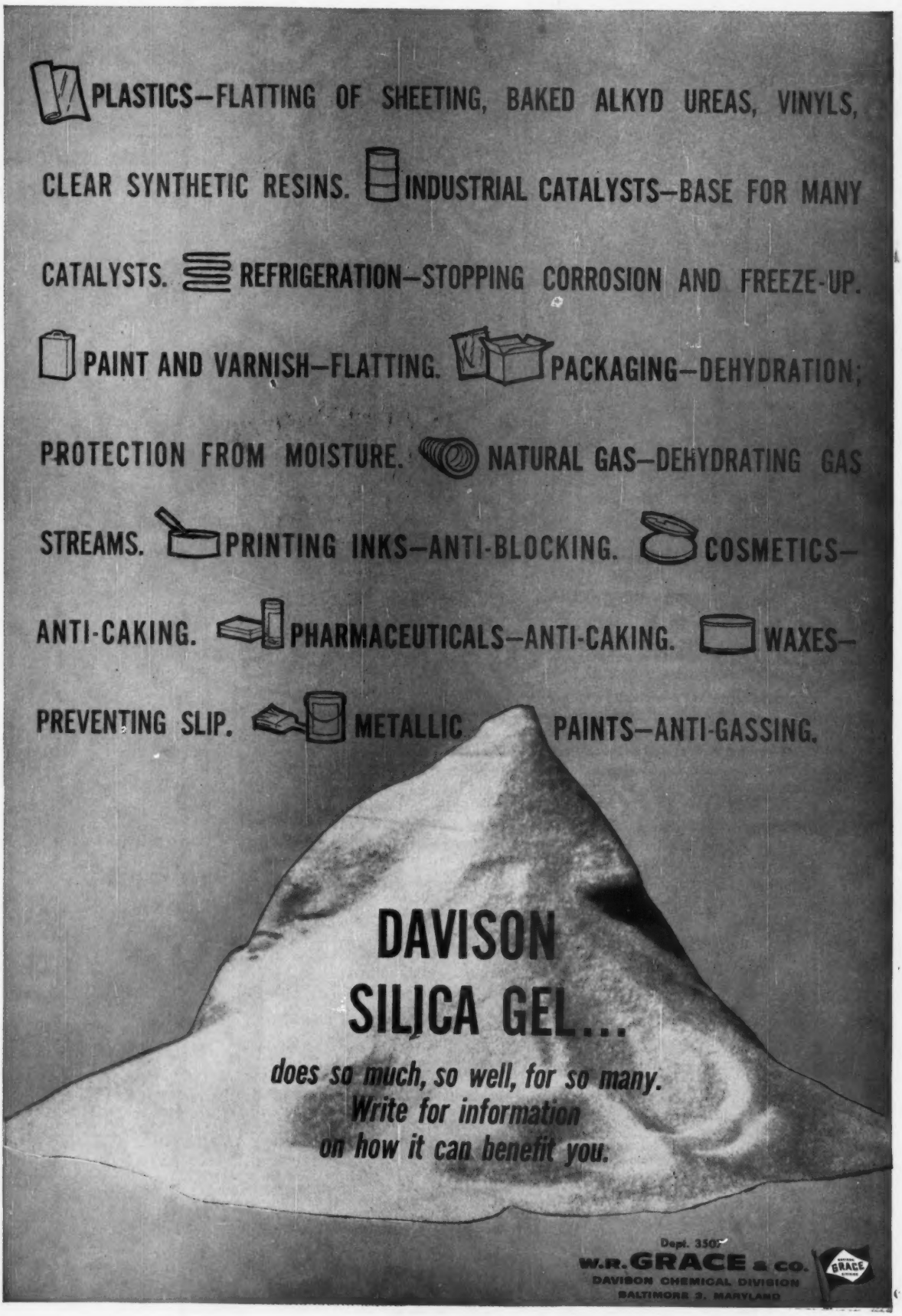
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Business
Newsletter

CHEMICAL WEEK
August 27, 1960

Private industry still has its ups and downs in the nuclear field.

Olin Mathieson has just won a contract to supply nuclear core components for U.S. Army power-plant reactors in Alaska and Greenland; Goodyear Atomic Corp. has received a five-year extension on its contract to operate the Atomic Energy Commission's plant at Portsmouth, O., which turned out $16.6 million worth of uranium-235 for AEC's Atoms-for-Peace program during the past fiscal year; National Lead will continue to operate AEC's feed materials plant at Fernald, O., through '61; and General Electric has won three AEC contracts totaling more than $3.8 million for irradiation, testing, and investigation of nuclear fuel and control rod materials.

But AEC has rejected bids from five private companies for fuel-element billets for the new reactor now under construction at the Hanford Works, near Richland, Wash. AEC has decided to produce those billets itself, contending that the private companies' proposals "exceeded by a substantial margin the cost of production in AEC facilities" at Fernald and at Weldon Springs, Mo. AEC said its own cost estimate was adjusted to include costs not normal to government operation but common to commercial enterprises. Unsuccessful bidders: Engelhard Industries, National Lead, Olin Mathieson, Malinckrodt Chemical, and Westinghouse Electric.

•

Despite strong opposition from cigarette makers, sales of maleic hydrazide (MH-30)—a plant growth control chemical—are only slightly off from last year's pace in the tobacco-growing states. U.S. Rubber's Naugatuck Chemical Division—producer of the compound—says that in the first few weeks of the new tobacco marketing season there has been no evidence of discrimination against MH-30 users by the cigarette makers, despite manufacturers' warnings that it would damage tobacco quality (*CW, May 30, '59 p. 30*). The company says there's an actual increase in the number of acres treated, attributes the slight drop in sales to a trend toward lighter dosage per acre.

•

Final negotiations for Argentina's first synthetic rubber complex are in the works, and it's almost certain that Texas Butadiene and Chemical Corp. will win the contract by year's end. Plans call for Texas Butadiene to put up a $54-million, three-plant complex to produce 44,000 tons/year of butadiene, 60,000 tons of synthetic rubber, and 25,000 tons of carbon black. Styrene would come from a plant proposed by Koppers. Meanwhile, Fish Engineering (Houston) and the Argentine government are negotiating on the decree they signed for construction of an unrelated petrochemical complex.

•

This week Houston Chemical has taken another step toward becoming the third U.S. producer of tetraethyl and tetramethyl lead. It

awarded a $10-million contract to Singmaster & Breyer (New York) to build both TEL and TML facilities at its Beaumont, Tex., petrochemical site. TEL has been produced by Du Pont and Ethyl Corp. for years. Ethyl has been producing TML in commercial quantities since last April; Du Pont says it has just started making TML commercially at its Chambers Works (Deepwater, N.J.). Additional Du Pont capacity will be coming in by year's end. Both Socony Mobil and Standard Oil of California are pushing the new TML additive in the U.S. market, and Mobil's product, Tetramel, was reportedly introduced in England recently.

•

CPI reaction to proposed new Niagara power rates is favorable. This indicates that the chemical, metallurgical and electrode companies in the Buffalo-Niagara Falls area will be inclined to go ahead with their expansion programs, estimated at a total of $170 million. So far, the New York State Power Authority has given industry representatives only a tentative approximation on proposed rates. The figures are not being disclosed, but are expected to average out to something like 4½ mills/kwh. for large industrial users.

•

Consolidation, expansion—and new products—highlight the week in the pharmaceutical industry:

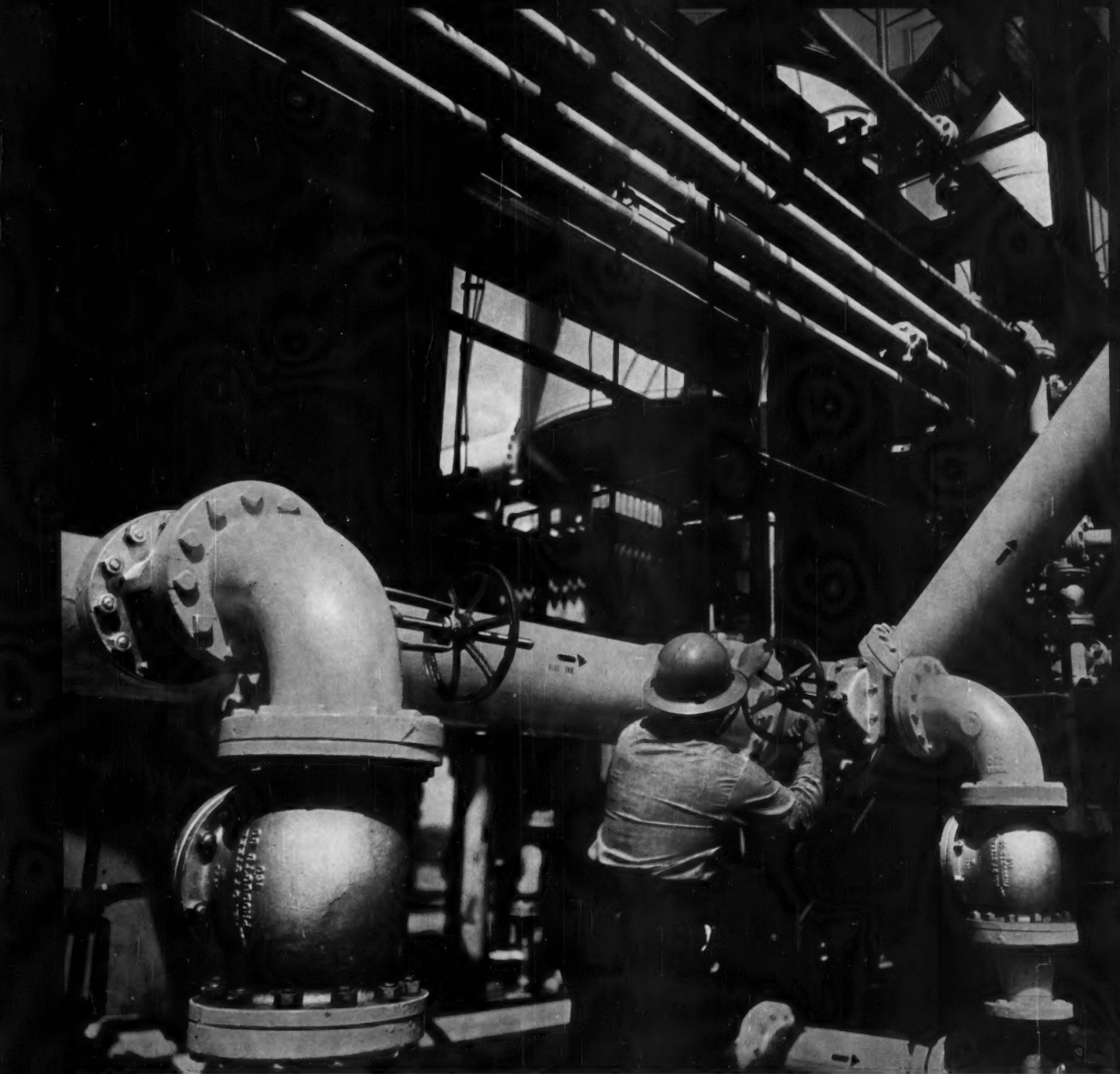
• G. D. Searle & Co. (Chicago) plans to invest $6 million in expanding existing units as well as for new ones over the next two or three years. Major outlay will be at its Skokie, Ill., labs. Also planned: expansion of manufacturing units in England and completion of manufacturing plants in Argentina and Mexico.

• Strong Cobb Arner—the firm founded about 14 months ago by merger of Strong Cobb (Cleveland) and Arner Co. (Buffalo, N.Y.)—is consolidating headquarters and research activities at Cleveland.

• Philips Electronics and Pharmacal Industries has completed arrangements to acquire the Columbus Pharmacal Co. (Columbus, O.) for an undisclosed amount of cash, is also readying some new ethical drugs for the market. Last October this 66.7%-owned subsidiary of Consolidated Electronics Industries merged with Anchor Serum, a leading manufacturer of animal vaccines, then turned its research attention to the field of human medicine. (Through patent license and technical information agreements, the company has access to new developments in the pharmaceutical fields originating with N. V. Philips-Duphar of the Netherlands.) Its latest acquisition is expected to result in manufacture of several new ethical-drug products. Example: a new measles vaccine is now being readied for public use after extensive testing here and abroad.

•

Latest of the big merger speculations — Allied Chemical and American Potash & Chemical—proved to be well founded. Peter Colefax, AP&CC's president, said late last week that there had been exploratory discussions, but that the matter had been dropped. No reasons were disclosed.



Aloyco Valves in General Chemical's new "dream" plant

The Aloyco Valves you see here are controlling the flow of 98% acid in the new sulfuric acid plant of General Chemical Division, Allied Chemical Corporation, at Elizabeth, New Jersey.

The plant utilizes most modern processing techniques. All equipment was chosen for its special ability to contribute to operating efficiency and long life.

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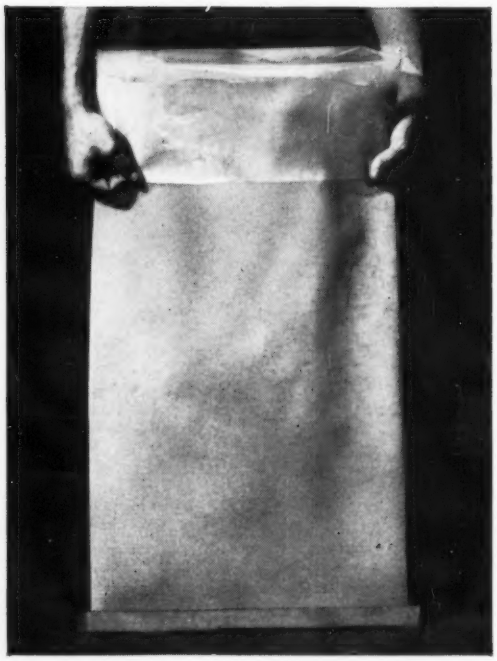

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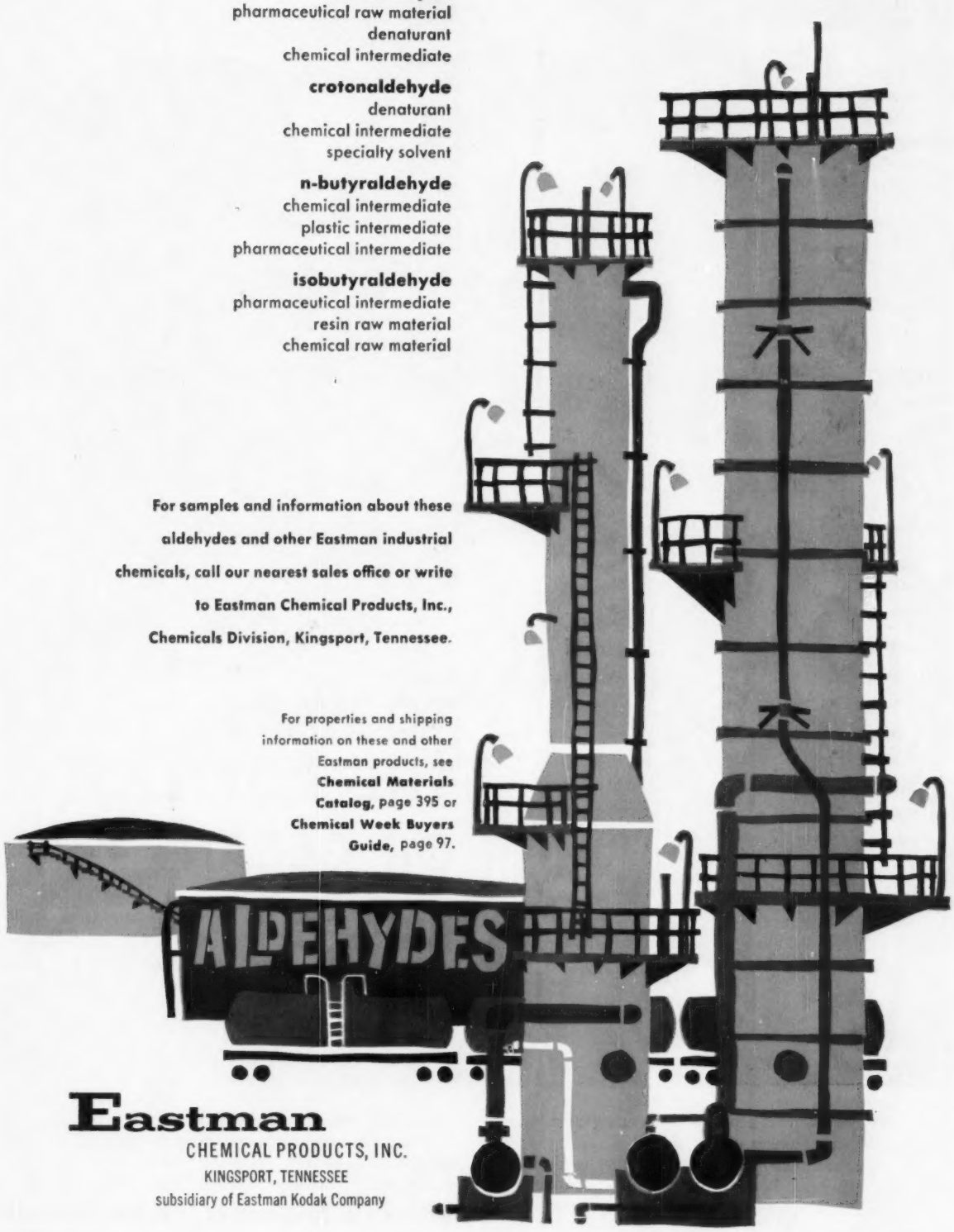
For properties and shipping information on these and other Eastman products, see **Chemical Materials Catalog**, page 395 or **Chemical Week Buyers Guide**, page 97.



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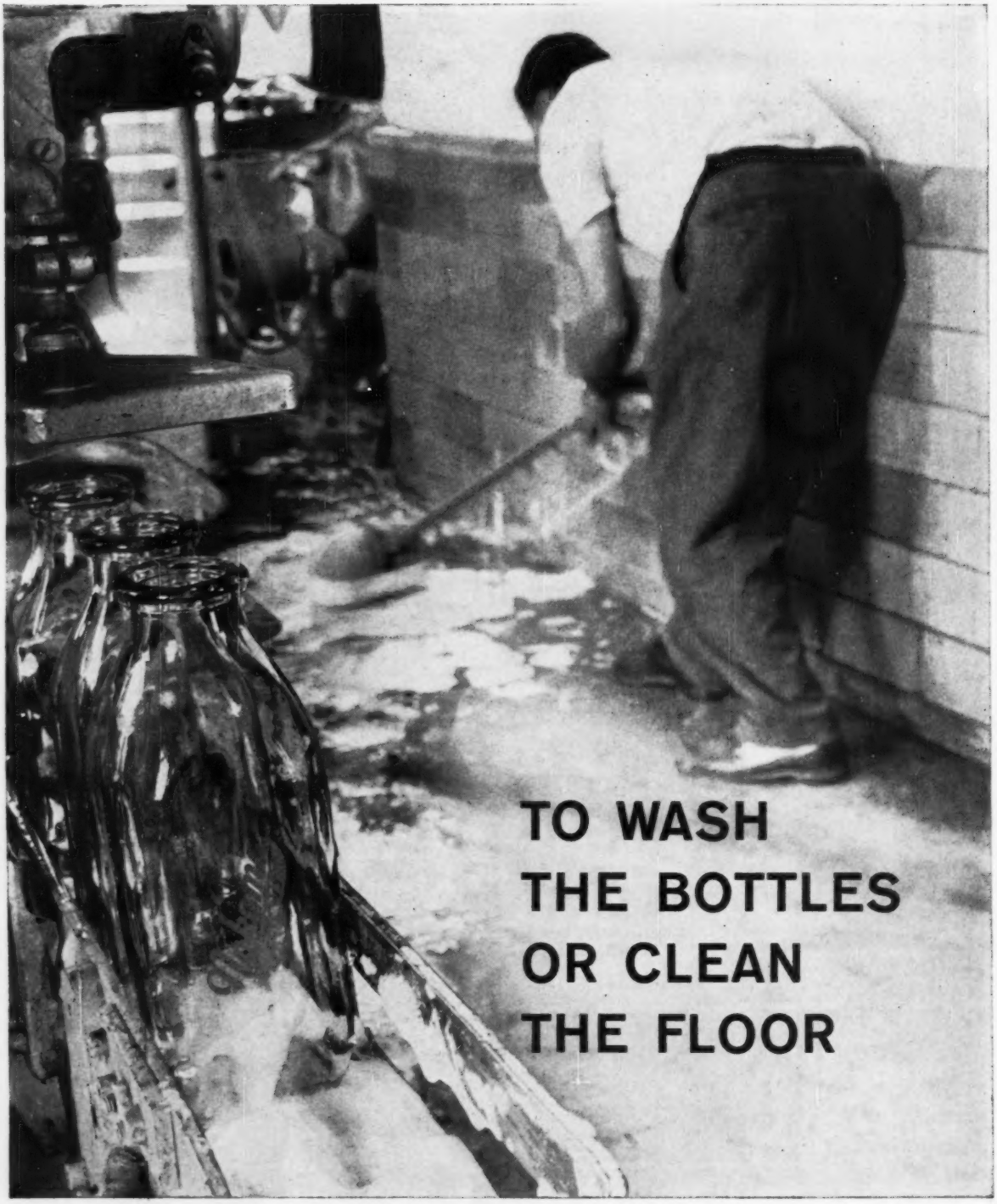

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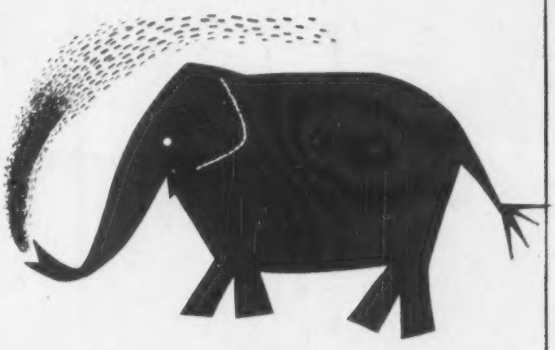

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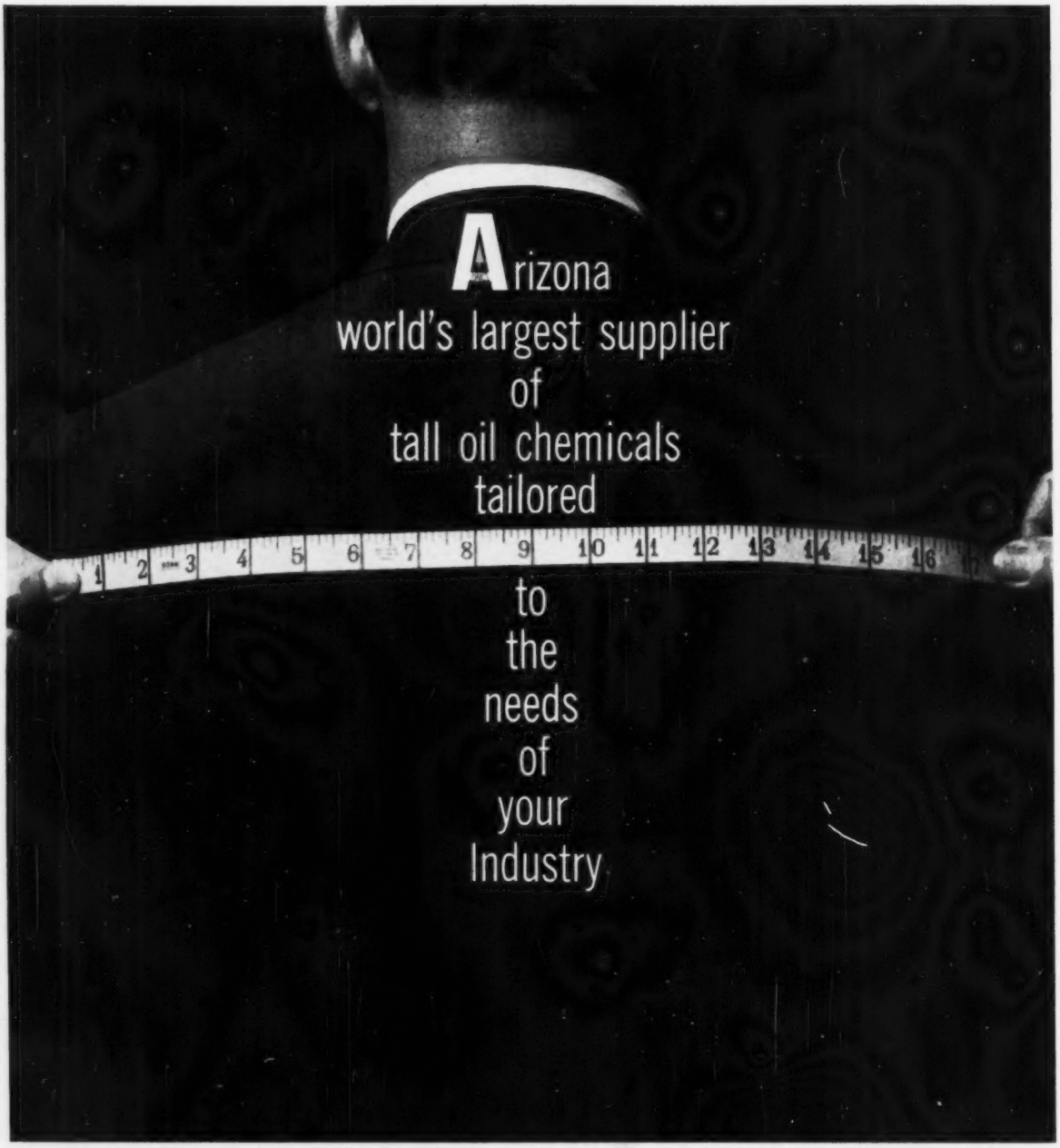

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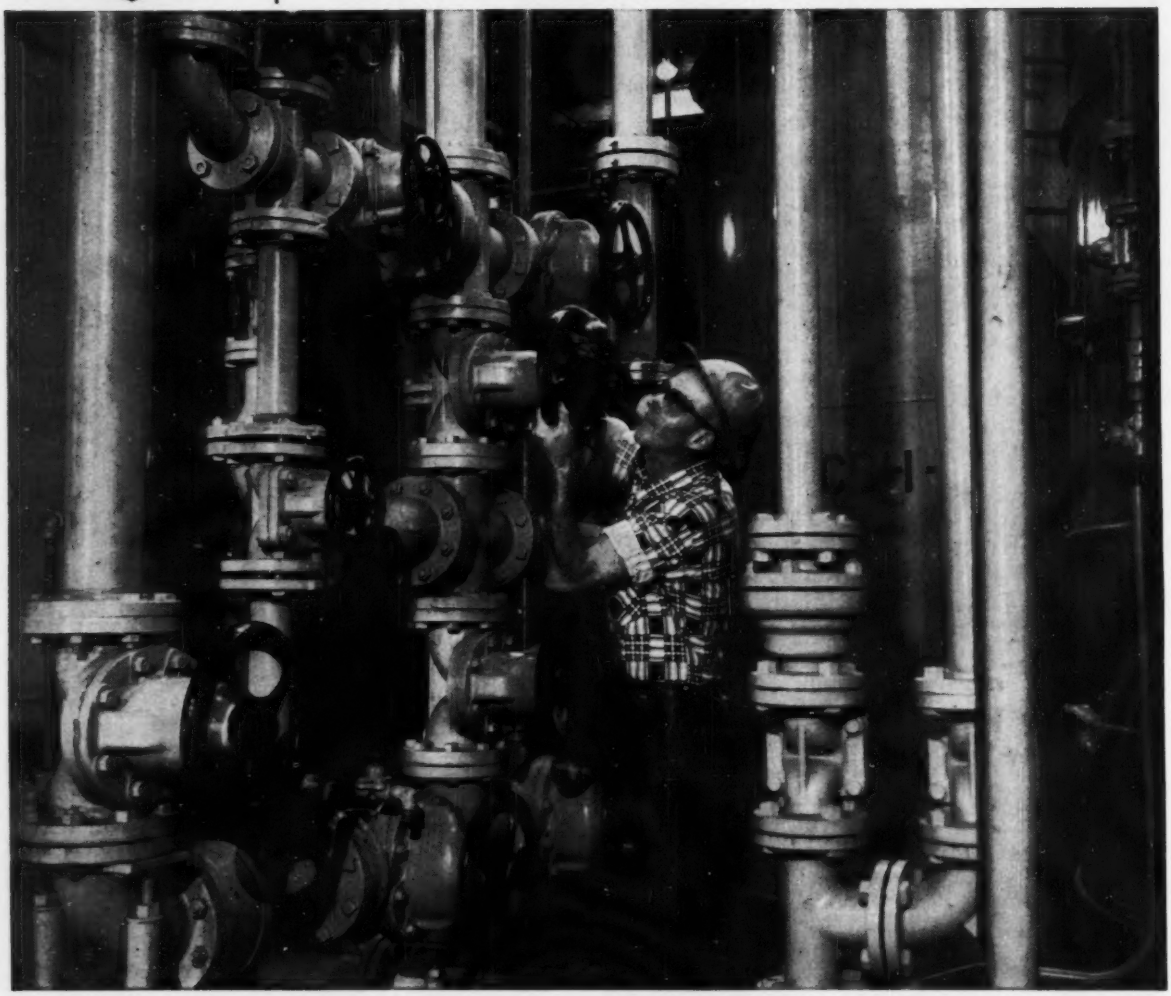

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When five miles of process piping must carry an unfailing flow of highly corrosive acids, thorium salt solutions and slurries . . . when frequent flow changes require quick, on-the-spot pipeline modifications . . . that's when the extreme corrosion resistance and easy workability of Saran Lined Pipe make this process pipeline a process lifeline.

Above is one section of the approximately five miles of Saran Lined Pipe which carries process chemicals in thorium recovery operations at the American Potash & Chemical Corporation's Lindsay Chemical Division plant, West Chicago, Illinois. In this process, Saran Lined Pipe is required to carry highly corrosive materials: sulphuric acid slurries for ore leaching; reacted thorium sulphate solutions and waste slurries; concentrated hydrochloric acid, hydrofluoric acid slurries. The pipe network has been in constant use since 1947, and *there's never been a major process shutdown because of pipeline failure!*

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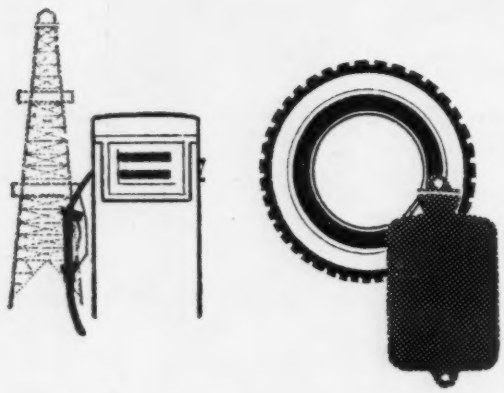

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In hydraulic brake fluids, and other functional fluids, they impart excellent viscosity-temperature characteristics; are noncorrosive to metals, easily inhibited to prevent oxidation in formulations, and do not adversely affect rubber.

In pharmaceuticals and cosmetics they are bases, binders, humectants, lubricants, emulsifiers, anti-dusting agents.

Perhaps your product can be improved with one of Wyandotte's many PLURACOLS: The PLURACOL E series of poly*ethylene* glycols includes four liquid, and six solid grades; the PLURACOL P series of poly*propylene* glycols includes four liquid grades. Write, detailing your requirements, and we'll forward appropriate samples and data for your evaluation. And, we'll be happy to help you investigate any possible new applications. Get in touch with us. *Wyandotte Chemicals Corporation, Department 789-W, Wyandotte, Michigan. Offices in principal cities.*

*PLURACOL® is Wyandotte's registered trademark for its polyoxyalkylene glycols.

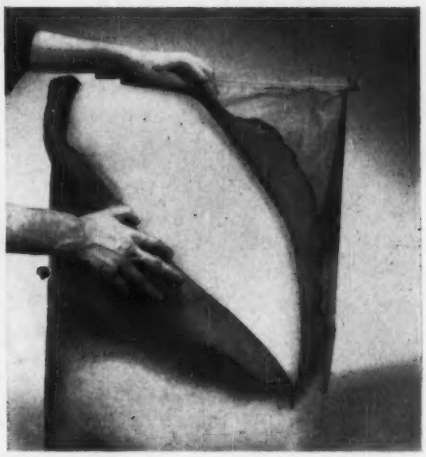
Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

Pacing Progress with Creative Chemistry

SILICONE NEWS from Dow Corning

Release With Real Ease



Sticky Products Won't Stick To Paper with a Syl-off Coating!

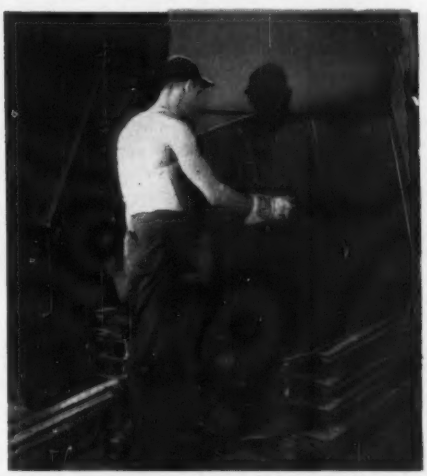
Unloading sticky gums, stocks and compounds from shipping containers, storage wrappings and interleaving is no fun when it's a tug of war—it's a costly chore. Manufacturers lose production time and lose money on material left sticking to the wrapper . . . and operators lose their temper.

Now you can be rid of this profit-eating problem. The solution is Syl-off* paper coatings developed by Dow Corning. These new silicone coatings resist sticking better than any other specialty coatings . . . stubborn stickers, such as unvulcanized rubber, latices and pressure-sensitive adhesive masses come clean quickly and easily.

Job Proved. Here's an example that's typical of the effectiveness of these Dow Corning coatings. A well-known company offers camelback on cores coated with Syl-off. Of all core treatments tested, only Syl-off gave completely satisfactory release . . . even after prolonged storage. Retreaders can easily remove *all* the camelback . . . none is left sticking to the core. Syl-off coatings are used with similar success on interleaving, multiwall bag liners, drums, boxboard and many other types of packaging.

How can Syl-off help you? If you ship sticky materials, Syl-off coatings assure your customers of stick-free, waste-free releases . . . provide an important sales advantage. If you receive, handle and process sticky products, you stand to save by specifying Syl-off coatings. You slash unloading time, shorten production time . . . and you throw away only the package — not a bit of the packaged product you've paid for.

In addition, you'll find Syl-off coatings have excellent water and moisture resistance; won't migrate, transfer or contaminate. They often last as long as the paper itself, and their light weight frequently means lower costs when shipping coated paper.



For more information about Syl-off paper coatings and a complete list of approved sources of paper and paperboard made with Syl-off coatings contact any Dow Corning branch office or write Dept. 2208

* T. M. Dow Corning Corporation

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

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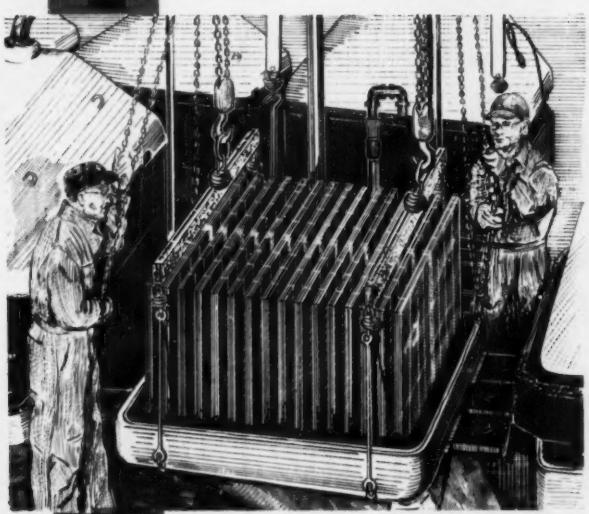

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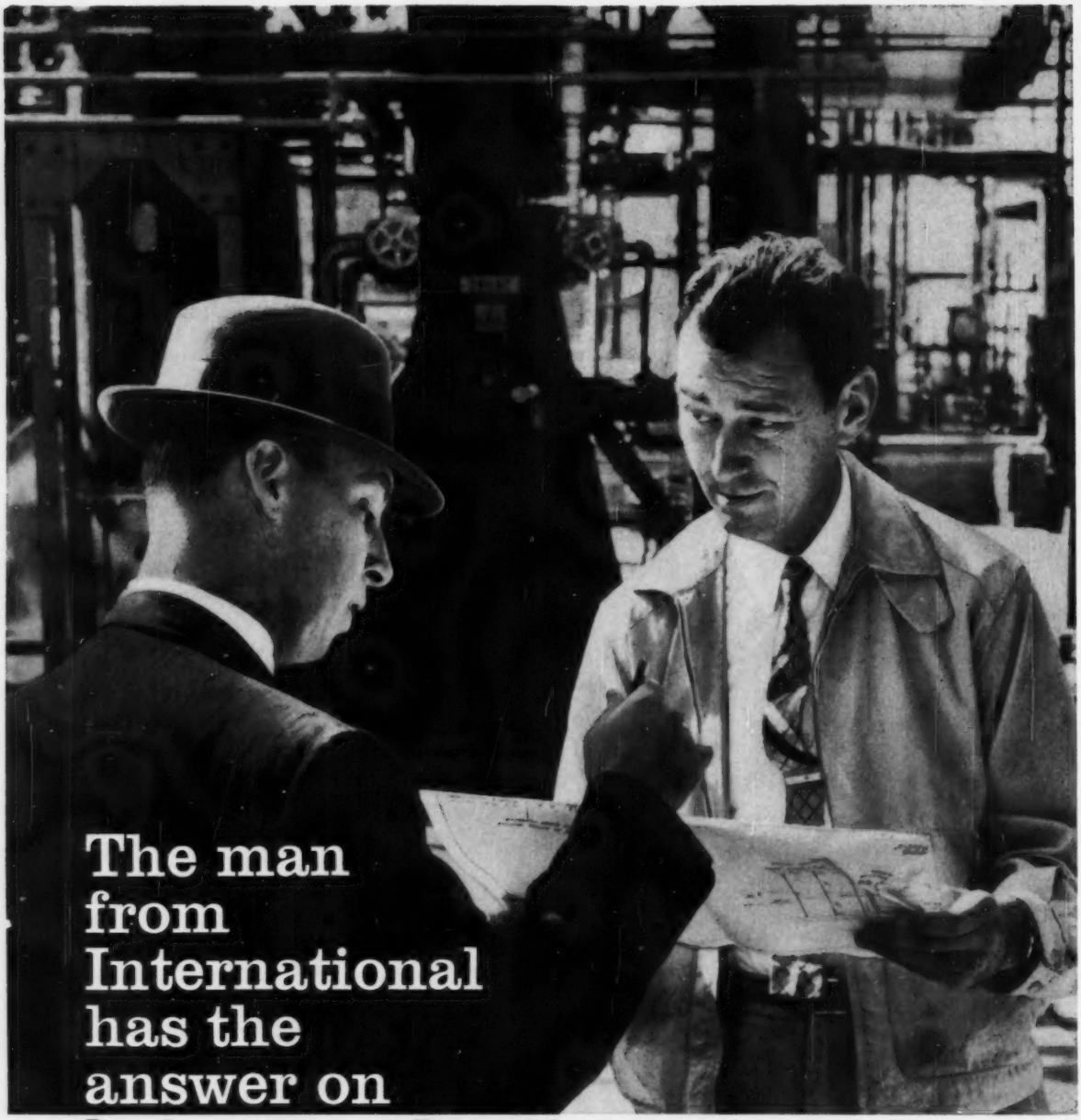

The man from International has the answer on brine production

Final details for a new brine-production system are checked by an International Salt Company sales engineer and his customer. Specially designed to fit a medium-sized plant where interior space is unavailable, the system calls for a storage Lixator*, a large-scale rock-salt dissolver operating on the self-filtration principle discovered by International. Lixators can be adapted to meet any space and production requirements. The man from International is a technical specialist in the efficient production, use and storage of brine. His experience, knowledge and on-the-spot service are the vital extras that make International the first choice of so many salt-using companies. To put these extras at your disposal, contact International Salt Company, headquarters: Clarks Summit, Penna., or the district office nearest you: Boston, Buffalo, Charlotte, Chicago, Cincinnati, Detroit, Newark, New Orleans, New York City, Philadelphia, Pittsburgh, St. Louis.

*Reg. T.M. of the International Salt Company.

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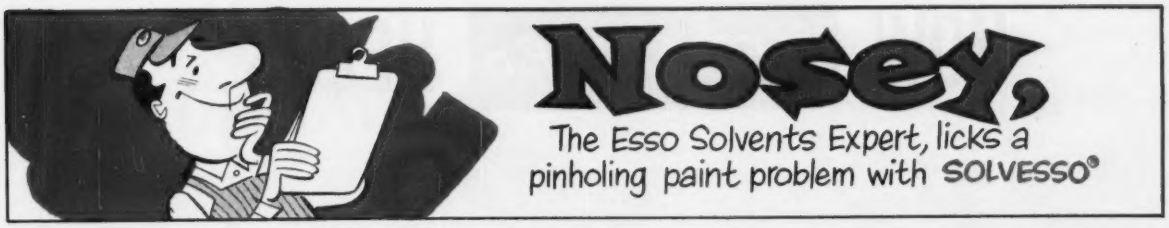
"A STEP AHEAD IN SALT TECHNOLOGY"



Nosey,

The Esso Solvents Expert, licks a pinholing paint problem with SOLVESSO®

I told him that SOLVESSO could help relieve these production headaches by controlling the evaporation better.
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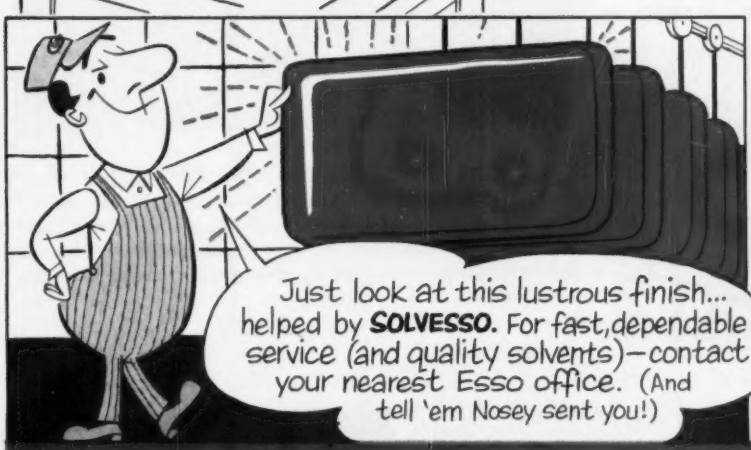
"Sounds great", he said. (He was also glad to learn that Esso is a pioneer in better odor solvents —and that Esso has a staff of experts in its refineries dedicated to the continuing improvement of solvents.)


Just look at this lustrous finish... helped by SOLVESSO. For fast, dependable service (and quality solvents)—contact your nearest Esso office. (And tell 'em Nosey sent you!)

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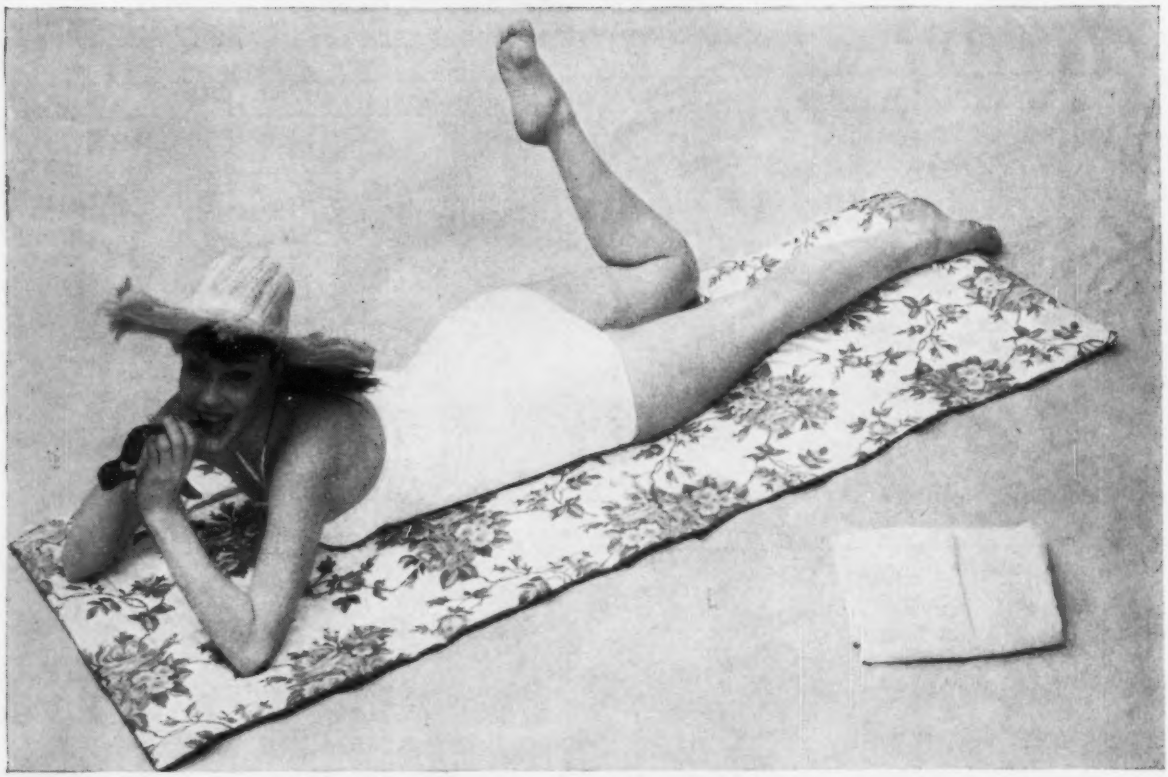
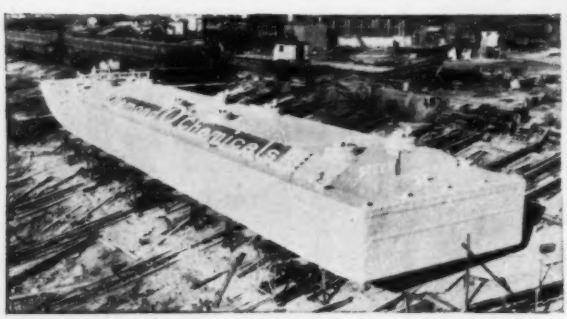
HOW *HERCULES* HELPS...



ON THE BEACH—Fun in the sun can easily become a nuisance when insect pests attack. But there's no problem when you use this beach roll made by the Julee Manufacturing Corp. The roll is impregnated with Metadelphene* Hercules diethyltoluamide—the most effective insect repellent yet devised. That's why Metadelphene has become the leading choice for all types of repellents—including lotions, sprays, creams, and roll-ons.

**Hercules trademark*

KEEP A BARGE "SHIPSHAPE"—Paints based on Parlon®, chlorinated natural rubber, were specified during the construction of this modern chemical carrying barge. Diamond Alkali Company found that Parlon, made by Hercules, is resistant to chemical corrosion and salt spray, and easy to apply and easy to maintain.



MAKE BETTER TUBING—This 33-foot length of Spiralloy® filament-wound, resin-bonded glass fiber is made by Young Development Division of Hercules. It weighs only 65½ pounds. It's flexible but won't dent, and most important of all, Spiralloy is lighter than aluminum and stronger than steel, an amazing strength-to-weight ratio.

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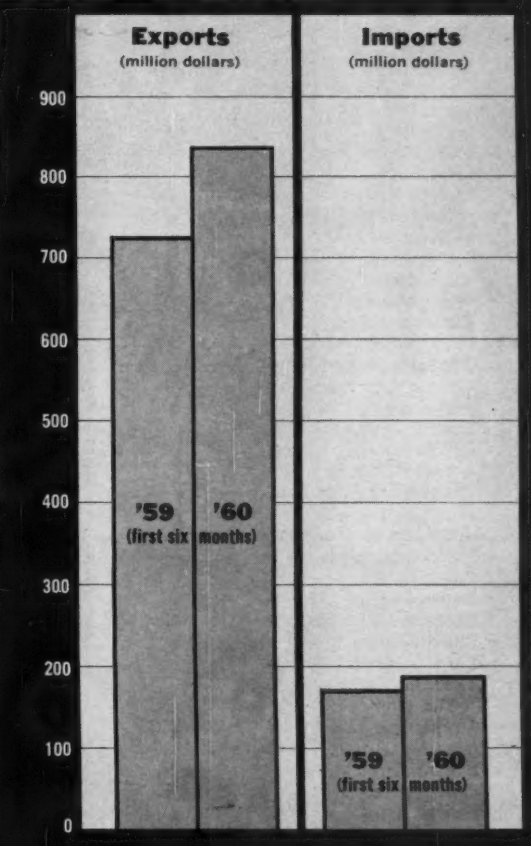
CHEMICAL MATERIALS FOR INDUSTRY

HERCULES

Chemical Week — August 27, 1960

U.S. Chemical Trade Balance Grows Fatter in First-Half '60



Shaping Up: Record Export Year

Business is booming overseas, and U.S. chemical exports are booming with it. With the U.S. trade figures for June now available, it's clear that domestic producers are well on their way toward setting an all-time export record this year.

During the first six months of this year, U.S. chemical exports swelled by more than 15% over those of first-half '59. And if the predictions of government experts hold up, this growth rate will continue throughout the year, and possibly increase, bringing the 12-month total to as much as $1.8 billion.

Imports, too, are up, but less dramatically. For the first six months, they're up 11.4%, although the curve was on the downslide during the second quarter, as U.S. business activity gained more slowly than expected.

While spurts in imports of individual chemicals may bear out the complaints of some U.S. producers, the balance of trade over-all is still overwhelmingly in favor of domestic producers; and the trend will continue for the rest of this year, at least.

There are several reasons for the export boom. The Commerce Dept. believes its export promotion program—which includes credit guarantees, stepped-up output of trade information, and official spurs to bolster interest in export opportunities—has begun to pay off. Commerce feels this program has helped chemicals as much or more than any other class of product.

The dropping of restrictions on dollar-area imports has also been a big help, particularly in chemical exports to Britain and France.

Moreover, U.S. chemical sales to Latin America have picked up, after some hard blows from European competition, and new markets are opening up in Africa, the Middle East and Asia.

Surge in Europe: But if there is

U.S. Chemical Foreign Trade

First-half 1960, vs. first-half '59

EXPORT

Total Chemicals & Related Products, up 15.4%, to $836.4 million

Selected Products	Unit Quantity (in millions)	Change	Value ($ million)	Change
Benzene	gal. 11.2	up 117.6%	4.6	up 253.8%
Toluene	lbs. 217.2	up 85.2%	5.6	up 81.6%
Phthalic anhydride	lbs. 10.0	up 170 %	2.3	up 310 %
Styrene monomer	lbs. 74.4	up 68.9%	9.3	up 65.8%
Vitamins	——	——	15.5	down 0.7%
DDT formulations	lbs. 51.7	up 20.2%	17.2	up 20.3%
Fungicides	lbs. 10.5	up 29.6%	5.7	up 29.5%
Styrene resins	lbs. 68.9	up 29.3%	16.5	up 23.8%
Alkyd resins	lbs. 20.8	up 46.5%	6.5	up 42.3%
Vinyl resins, uncompounded	lbs. 20.0	up 69.5%	5.9	up 47.6%
Vinyl resins, compounded	lbs. 12.1	down 7.5%	3.9	down 11.4%
Tar acid resins	lbs. 12.3	up 1.8%	4.2	up 9.8%
Urea-formaldehyde, melamine-formaldehyde, other amino resins	lbs. 12.5	down 2.2%	4.4	down 7.1%
Polyethylene resin	lbs. 164.4	up 10.4%	48.1	up 3.4%
Cellulose ester plastics, except molding & extruding compounds	lbs. 5.9	up 11.1%	7.6	up 10.8%
Detergents	lbs. 35.5	down 17.7%	7.9	down 16.8%
Antiknock compounds	lbs. 26.1	up 32 %	9.0	up 25.4%
Petroleum additives	——	——	21.4	up 15.9%
Ethylene glycol	lbs. 69.5	up 14 %	8.0	up 9.3%
Butanol	lbs. 42.8	up 107.8%	5.8	up 132.7%
Boric acid & borates	lbs. 306.0	up 16.8%	13.0	up 20.7%
Caustic soda, solid	lbs. 127.0	down 17.5%	4.3	down 20.4%
Carbon black	lbs. 278.1	up 16.2%	25.3	up 18.8%
Titanium dioxide & TiO pigments	lbs. 36.4	down 4 %	5.3	up 0.9%
Ammonium sulfate	lbs. 162.8	down 63.7%	2.6	down 66.8%
Urea	lbs. 39.1	down 59.3%	1.6	down 70 %
Superphosphate, concentrated & enriched	tons 0.116	down 32.6%	6.4	down 30.4%
Potassium chloride	tons 0.358	up 57.5%	10.2	up 48.4%

IMPORT

Total Chemicals & Related Products, up 11.4%, to $189.7 million

Selected Products	Unit Quantity (in millions)	Change	Value ($ million)	Change
Benzene	gal. 20.9	down 9.5%	5.1	down 7.5%
Naphthalene	lbs. 21.2	down 37.3%	1.5	up 26.7%
Acetanilide	lbs. 0.9	down 71 %	1.1	down 71.7%
Caffeine	lbs. 0.4	down 14.2%	0.8	down 20.9%
Menthol	lbs. 0.4	up 28.3%	2.4	up 60.9%
Vitamins	——	——	2.4	up 38 %
Trichloroethylene	lbs. 32.1	up 10.3%	2.3	up 5.3%
Vinyl acetate monomer	lbs. 22.6	up 27.5%	3.8	up 30.2%
Tartaric acid	lbs. 1.7	down 34.2%	0.6	down 34.7%
Chloroacetic acid	lbs. 5.1	up 6.1%	0.8	up 13.2%
Glycerine, crude	lbs. 6.4	up 1.9%	1.1	up 9.6%
Sodium cyanide	lbs. 8.8	down 39.3%	1.2	down 27.9%
Furfural	lbs. 16.0	down 30.9%	1.5	down 31.4%
Ammonium sulfate	tons 0.152	up 33.9%	5.3	up 21.1%
Sodium nitrate	tons 0.224	down 5.6%	7.5	up 13.6%
Urea	tons 0.046	up 16.6%	4.0	up 7 %
Ammonium phosphates	tons 0.070	down 23.7%	4.4	down 24.9%
Potassium chloride	tons 0.183	up 23.7%	5.2	up 23 %

a single factor that stands above the others in explaining the chemical export surge and predicting how long it will last, that would be high-gear industrial activity in Western Europe —this country's largest regional chemical customer.

From a reading of Western Europe's industrial barometer, U.S. exporters can expect sales to continue rising at a good clip through the rest of '60, leveling out a bit in '61.

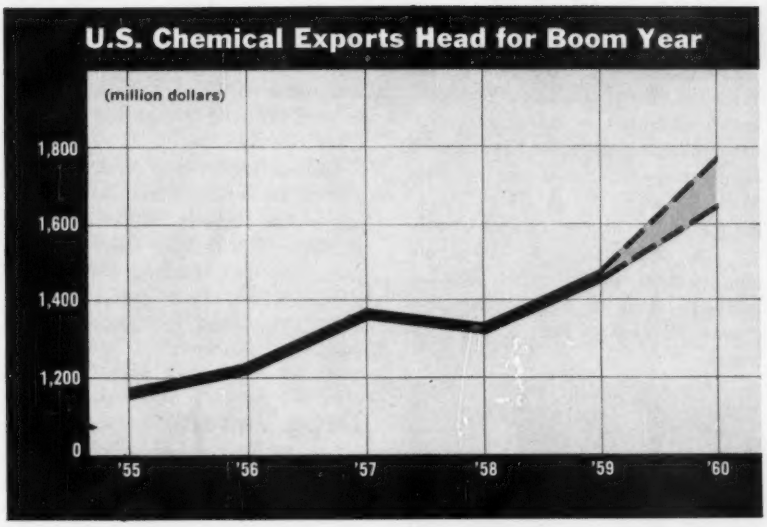
England has been one of the sprightliest U.S. chemical markets—and our biggest in Western Europe. British imports of U.S. chemicals have been rising steadily during the last few years, but they gave an extra spurt this year. Compared with first-half '59, they shot up 44% in the first six months of this year—to $68.8 million, by British calculations (which, like figures of other European countries, are considerably higher than comparable U.S. figures). Besides the demands of the U.K.'s booming industry (particularly the chemical industry), the spurt has been abetted by the dollar import liberalization, which went into effect early last year, and low prices.

A number of chemical producers (particularly U.S. subsidiaries) have shifted to dollar supplies for various chemicals—e.g, propylene tetramer, and acetone. In some cases, U.S. exporters have benefited by duty exemptions due to local and sometimes worldwide shortages.

Among the products that have gained from one or more of the foregoing factors: ethylene glycol, toluene diisocyanates, polyester and melamine resins, high-purity silicon, and dyestuffs.

U.S. chemical exports to the U.K. are expected to continue rising, but not so steeply. To meet U.S. competition, U.K. producers are trimming prices. Case in point: acetone polystyrene, and epoxy resins (*CW Market Newsletter, Aug. 13*). And the buildup of local capacity—particularly in petrochemicals—will take its toll on U.S. exports.

Jumping Germany: Until '60, U.S. chemical exports to West Germany had been growing steadily at the respectable rate of about 20%/year, and they were expected to register a similar gain this year. Instead they jumped an astounding 50% during the first five months of '60; and surprised



German officials now predict the trend will continue through the year, boosting the total to $210 million, compared with '59's $141.4 million.

The biggest single factor in this striking growth is the demands of Germany's chemical industry for raw and semifinished materials. German industry men expect imports from the U.S. will continue to grow at a sizable rate next year, although some bottlenecks in German plastics and petrochemical production may be eliminated.

Leveling Out in Italy: Italy, enjoying the fastest industrial expansion in Europe this year, helped fuel this growth by doubling (over the comparable '59 period) its imports of chemicals from the U.S. during the first four months of this year. Government economists expect the trend to continue through '60, then to dip next year. Reason: reserve supplies of imported chemicals ran dry late last year, and manufacturers are expected to take the rest of the year to refill their bins, cutting down imports after Christmas.

Despite the standout growth of the French chemical industry, U.S. chemical exports to that country rose only about 9% during the first quarter of this year, over first-quarter '59. Later figures aren't yet available, but it's generally expected that chemical imports from the U.S. will continue rising slightly throughout the year, particularly in intermediates—e.g., coal-tar and other cyclic acids. (Imports of these products from the U.S. increased almost fivefold between '58 and '59.)

But the French are now boosting capacity for intermediate organic chemicals and U.S. imports are likely to slow down starting next year. Just last week, for example, Reichhold's French affiliate let a contract for its maleic anhydride plant.

Coal Tar to Newcastle: Stamped on the first-half trade figures is the impact of last year's steel strike, plus this year's reduced steel operations. The resulting pinch in coke-oven chemicals produced distortions in the export pattern.

Coupled with these steel factors is the European shortage of coal tars and their derivatives. Demand for benzene and phthalic anhydride, for example, picked up sharply both in the U.S. and abroad. While the U.S. market for these products is still tight, exports have nevertheless increased, spurred by premium overseas prices. Notes exporter James Baird, "I even exported coal tars to Newcastle."

This high bidding is reflected in the benzene export figures. In terms of quantity, benzene exports rose 177.6%, but the value of these exports jumped 253.8%. Similarly, European plastic industry demand for phthalic anhydride forced up the value of exports by 310%, while actual volume rose less than half that amount.

Another notable trend in the export pattern is the continuing decline in fertilizers—e.g., urea, ammonium sulfate, and superphosphates—as worldwide capacity mounts.

Activity in Antibiotics

The corporate image of drugmakers is taking it on the chin again in the wake of an episode last week involving new prices on antibiotics. Criticism is over the drug producers' handling and timing of their price move on tetracyclines—which provides additional discounts of 15% on their direct-retail accounts, but has no effect on consumer prices of broad-spectrum antibiotics.

One charge is that the original release on the price move was misleading, was made to sound as if consumer prices would be reduced. A second complaint is that the action was taken just before the start of Senator Kefauver's investigation (Sept. 7) into the pricing policies of the $400-million/year antibiotics industry—largest of all ethical-drug groups.

To the latter charge, a drug spokesman emphasizes: "It's just a coincidence that the move was necessitated close to the date that drug hearings in Washington will resume."

To the first charge, everyone agrees that consumer prices will not be reduced. Both industry spokesmen and Washington staff members of Sen. Kefauver's Antitrust and Monopoly Subcommittee agreed this week that the extra discount would not change the suggested retail prices of antibiotics.

However, some industry observers claim that a smoke screen was thrown up by the drug firms, that it wasn't clear from the beginning that the move was not aimed at reducing consumer prices.

What Was Happening: Pfizer initiated the discount, was quickly followed by three other major producers of tetracyclines—Upjohn Co., Squibb Division of Olin Mathieson, and Lederle Division of American Cyanamid.

First reports of the news were interpreted to mean lower consumer prices on the drugs would result. But all producers were quick to stress that the move was aimed only at "certain large wholesalers," who for some time had been offering broad-spectrum antibiotics produced by these major suppliers at a price lower than Pfizer or the other firms were offering to their own direct-retail accounts. The products involved: Terramycin, Achromycin, Aureomycin, Panmycin, Steclin and Fumycin—

drugs effective against a broad spectrum of bacteria.

It's standard industry practice for direct-retail accounts to buy these products at 40% off the list (consumer) price. Wholesalers, who buy in bulk, have been getting the 40% off, plus an additional 20% in which to make their profit. But reportedly, a few wholesalers have been passing their discount along. Result: the products turn up in the market cheaper than the companies could sell direct. Also, says Pfizer, antibiotics sold to hospitals, government institutions and other classes of trade where volume determines price were reaching its trade accounts at lower prices.

Thus a distribution problem, according to the companies, is substantially corrected by the new discount.

New India Price Policy

In another move to attract foreign investment, the Indian government has established (subject to Cabinet approval) a new pricing policy for nitrogenous fertilizers. The plan, which would guarantee government-fixed prices on fertilizers produced by private companies, is based on average prices of similar products produced by state-owned plants. It is intended to assure potential foreign (including U.S.) manufacturers that their products would not be sold at uneconomical prices on the Indian market, and that they would be assured of a fair deal in marketing their products.

Marketing is now a government monopoly. All products go into a central pool and prices are fixed according to a formula based on the cost of local production, imported fertilizers and overhead percentages. Despite the objections of potential investors, there are no signs that this arrangement will change—at least in the nitrogenous fertilizers area.

In another development Sindhri Fertilizers, with a plant in Bihar state, and Hindustan Chemicals and Fertilizers Ltd., operator of a new plant at Nangal in North India, will merge Oct. 1, form the state-owned Fertilizer Corp. of India. These companies currently are the only producers of nitrogenous fertilizers in India. The new corporation will take over projects in Trombay (near Bombay) in Assam, which will use natural gas as fuel.

Two Take Growth Steps

Two Ohio chemical companies made news last week: DuBois Chemicals, Inc. (Cincinnati) — manufacturer of specialized cleaning and processing compounds—was listed on the New York Stock Exchange "Big Board" for the first time; and Cowles Chemical Co. (Cleveland), a 75-year-old manufacturer of industrial cleaning products, made its first acquisition—Promat Division of Poor & Co. (Chicago).

Cowles' Huntley: Moving into metal-finishing products in the Midwest.

Promat makes and distributes metal-finishing specialties such as electroplating additives, brighteners and metal colorants at Poor's Waukegan, Ill., works (Cowles says this plan will be continued). It was a "natural expansion," says Cowles President Robert Huntley, since Promat's list fills out Cowles line of metal cleaners, zinc and phosphate coatings and other metal-treating chemicals. In addition to gaining a line of metal-finishing products, Cowles will get Promat's coast-to-coast dealer-and-jobber arrangement.

Cowles expects sales this year to reach about $10 million; they were $8.6 million in '59. Promat's sales and earnings are not published separately by Poor, and Cowles' price for the division was not disclosed.

Sales Up Sharply: DuBois, to be known on the Exchange floor as DU, was listed with a total of 2,477,021 shares of capital stock. The company has approximately 2,600 common stock owners. In the fiscal year ended last Feb. 29, DuBois racked up net sales of $25.3 million, and net income after taxes of $2.3 million, compared with sales of $21.5 million and net income of $2.1 million for the previous year.

DuBois has its main plant and general offices in Cincinnati; other plants are in Los Angeles, Dallas and East Rutherford, N.J. Aside from chemical processing and cleaning compounds, it manufactures and distributes specialized dispensing and control equipment.

Drug Vexers

Pricing of pharmaceuticals and growth of prescription sales by mail were two agenda items that sparked spirited comment last week at the convention of the American Pharmaceutical Assn. in Washington.

APA President Howard Newton sounded a warning against the prescription-by-mail business, said it offers inferior pharmaceutical services (*CW, June 4, p. 61*). He commended the American Medical Assn. for opposing mail-order merchandising of prescriptions.

Newton added that the drug investigation of Sen. Estes Kefauver's Antimonopoly Subcommittee gave "aid and comfort" to the mail-order business.

Defends Pricing: An association statistical study of markups of drug prices defended the price pattern of the industry. It showed that the wholesale prices of ethical pharmaceuticals have declined more than 7% since '49. This contrasts with the 20% increase in all wholesale prices in the same period, the association report said.

Also noted; that the Bureau of Labor Statistics wholesale price index has a subgroup called "Drugs and Pharmaceuticals," which consists of 40 ethical and proprietary drugs and pharmaceuticals, but does not include new drugs such as the steroids, tranquilizers, broad-spectrum antibiotics and the new forms of vitamins.

Sharpest of the price declines since '49: antibiotics (which constitute about 25% of all new ethical-prescription pharmaceuticals) have declined more than 50% in price (see p. 39 for latest news on antibiotics pricing). Hormones (one-tenth of the total) declined 40%.

Hour of Decision in Europe

The future of West European economic integration, as well as Allied unity, is currently hanging on the outcome of profound diplomatic soul-searching now going on in the capitals of West Germany, France, and Britain. Decisions now being pounded out will spell out the fate of Europe's two trade blocs—the European Economic Community (Common Market) and the Free Trade Assn.—and can have a vital long-range effect on the U.S. chemical companies building plants in or selling products to Europe.

Tipoff to the new shifts were West German Chancellor Konrad Adenauer's separate meetings in the past few weeks with France's President Charles de Gaulle and Britain's Prime Minister Harold Macmillan.

First, Adenauer and De Gaulle agreed to set up some kind of European political coordinating body. Then with Macmillan, Adenauer agreed that Germany and the U.K. must take the lead in trying to bring together their rival trade blocs.

So far as European trade relations go, these agreements can have major effect in two principal areas:

- First, De Gaulle's idea of removing political decision-making from the Common Market Commission and establishing a separate political coordinating body might cripple the Common Market as such. Most observers feel it is vital that EEC have the power to deal with the kind of strains and conflicts that will result from its economic program.
- The present threat of a trade war between EEC and the Outer Seven would be eliminated if Macmillan and Adenauer succeeded in working out a "bridge" between them, or even a way to merge them. Hopes now are that some such arrangement may be worked out by the end of next year.

Behind the Shifts: A common motivation between all three leaders is their concern for uniting in the face of the Soviet threat, which is heightened by what they see as the growing inability of the U.S. to take a strong position of leadership.

But de Gaulle's concern for European unity is bound up in his ambitions for French leadership of a "third force" — a European power block independent of the U.S. He has gone along with the Common Market as a means to this end. He has opposed entry of Britain into the EEC club unless Britain became "European" —turning its primary allegiance away from the U.S. and toward Europe.

Adenauer has played along with De Gaulle because he considered the French-German unity essential to the

West Germany's Adenauer takes the lead in pulling West Europe together.

Western European alliance and West Germany's survival. But he has always put top priority on U.S. support in Western Europe.

Now De Gaulle's proposals have forced the issue, and have helped prompt a radical change in Adenauer's thinking, leading to his new effort to promote unity between the two European trade groups.

Whether this new try will succeed is far from certain. No concrete proposals were made at the Adenauer-Macmillan meeting, although Adenauer now agrees that some accommodation will have to be made for entry of Commonwealth goods into any new trade area. This has been the crucial stumbling block in the way of British entry into the EEC. Watering down the EEC's political power would also make it more feasible for Britain and its EFTA partners to enter (although this is not De Gaulle's intention).

The likeliest solution now seems to be setting up a custom union including both blocs.

This would involve free trade within the area — ideally — identical external tariffs. In practice, Britain will probably push for some variation in these tariffs against nonmembers. The problem: Would such an arrangement work without the political integration envisioned in the Common Market Plan?

One hopeful note for developing this wider European integration is the change in the U.S. government's opposition to a "bridge" between the blocs. For a variety of reasons—mostly political—the U.S. has adapted a wait-and-see attitude.

But whether these plans succeed depends in large measure on the still-unknown attitudes of De Gaulle.

Japanese Go West

The aggressive worldwide selling campaign of Japanese industrialists carried them to Moscow last week, where some 600 Japanese businessmen are displaying their wares in the biggest industrial exhibition ever held by Japan outside its home islands.

Included in the show are a wide range of chemical products: wood resin products, camphor, dyestuffs, paints, plastics, drugs, pigments, carbon black, silicone products, artificial fertilizer, and celluloid products. They were the products of members of Japan Plastic Industry Assn., Chemical Shoes Industry Assn., Celluloid and Nitrocellulose Manufacturers Assn, and individual producers—e.g., Mitsubishi Chemical, Dainippon Printing Ink Manufacturing Co., Hokko Chemical, Kawasaki Kasei Chemical Industries, and others.

Equipment was also on display, including an injection forming machine for plastics, a water purification unit, centrifuges, glazed reactors, etc.

Spokesmen for the show say they expect to sell all of the products on display.

On hand for the show was First Deputy Premier Anastas Mikoyan, who proclaimed the "boundless opportunities" for bettering relations between Japan and Russia, particularly in the field of trade.

And Japan's Minister of International Trade and Industry, Mitsujiro Ishii, declared Japan would push Japan-Soviet trade.

The fair, held in the buildings built last year for the U.S. exhibition, will run through the first week of September.

COMPANIES

Celgar Ltd., Celanese' Canadian affiliate, has arranged for placement of $30 million of 6⅛%, 20-year, first-mortgage bonds with The Prudential Insurance Co. of America. The funds will be used to construct a 500-tons/day bleached-kraft-pulp mill at Castlegar, B.C. Completion of the mill—scheduled for late '60—will complete a 2½-year construction program.

•

Enjay Chemical Co. has split its former Chemicals Division into two new product divisions to meet the increasing chemical complexity and volume now handled by the division. A section called Industrial Chemicals will handle alcohols, ketones and related products. Chemical Raw Materials will handle ethylene, butadiene, and similar raw materials.

•

International Latex Corp. (Dover, Del.), synthetic-latex and resin producer, has acquired Southern Latex Corp., manufacturer of latex compounds and chemicals.

•

Crompton & Knowles Corp. (Holyoke, Mass.), packaging and wrapping company, has acquired Bates Chemical Co. (Lansdowne, Pa.), certified color chemicals manufacturer, for a sum in excess of $1 million, plus C-K stock.

EXPANSION

Refractories: Kaiser Aluminum & Chemicals (Oakland, Calif.) will build a $500,000 facility adjacent to its basic refractories plant at Columbiana, O., to manufacture special refractories for steelmaking equipment. The plant is scheduled for operation by Jan. '61.

•

Glass Bottles: Owens-Illinois Glass Co. will purchase a 70-acre site at Brockport, N.Y., to build a multi-furnace glass container plant. The plant will be O-I's 18th for the production of bottles and jars.

•

Chlorinated Solvent: Hooker Chemical Corp. (Niagara Falls, N.Y.) is installing a new perchlorethylene production unit at its Western Chemical Division's chlor-alkali plant at Tacoma, Wash. Onstream target: about Sept. 1. Cost was not disclosed.

•

Dry Chlorine: Olin Mathieson Chemical Corp. is doubling its capacity for concentrated calcium hypochlorite (HTH) manufactured at Niagara Falls, to meet growing industrial and household (it's used to treat swimming pool water) demand.

The expansion—part of a multimillion-dollar program—calls for new equipment and increased capacity of present equipment, and will be completed in two steps: March and Dec. '61.

•

Antibiotics: S. B. Penick & Co. (New York), producer of bacitracin, neomycin and other standard antibiotics, has completed a $1.3-million, 2½-year program to expand its Newark, N.J., fermentation and purification facilities. Plant feature: automated continuous-recovery and isolation equipment.

•

Refinery: Badger Manufacturing Co. (Cambridge, Mass.) has begun work on Ashland Oil and Refining Co's. (Ashland, Ky.) new 32,000-bbls./day vacuum-distillation unit at Ashland's No. 2 refinery in Catlettsburg, Ky. The unit, scheduled for completion in spring, '61, is part of a 75,000-bbls./day crude unit. It will produce light and heavy gas oil for catalytic cracking charge stock, cylinder stock and asphalt.

FOREIGN

Fertilizers/Israel: Rassco, a leading Tel Aviv industrial company, and an unidentified U.S. investment group are planning a $1.1-million plant to produce fertilizers from garbage. Another firm, Fertilizers & Chemicals Ltd. (Haifa), will share in the major part of a $5-million investment being made this year in various Israeli industries by Israel Investors Corp. (New York).

•

Soaps/Brazil: Unilever Ltd. (Rotterdam) has bought Cia. Gessy Industrial S.A., Brazilian cleaning product producer, for an undisclosed sum. Gessy will retain its trade names, probably will eventually amalgamate with S.A. Irmos Lever, Unilever's other Brazilian subsidiary.

•

Chemicals/Italy: Celene, the joint subsidiary of Union Carbide and Societe Edison, has received a $2.8-million credit from the Export-Import Bank. The funds will be used to buy U.S. equipment and technical services to expand Celene's chemical plant at Priolo Melilli, Sicily.

•

Plastics/India: Phillips Petroleum Co. (Bartlesville, Okla.) has reportedly offered to set up a $24-million plastics plant near Gauhati in Assam state. The proposed plant would use natural gas from the Assam oil fields, eventually would go into synthetic rubber production. From Phillips: no comment.

•

Investment/India: The United Salt-Works & Industries Ltd. (Bombay) is seeking financial and technical assistance to establish a soda ash and potassium chloride plant. Ram Prakash and Sons (Delhi) seeks U.S. capital and technical aid to manufacture either ultramarine blue, lithopone, or metallic powders.

•

Butyl Rubber/England: Esso Petroleum Co., Ltd., is building a 30,000-tons/year butyl plant at its Fawley, Southampton, refinery. It's slated for completion in about three years, will supply Britain's needs for butyl rubber.

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Washington
Newsletter

CHEMICAL WEEK
August 27, 1960

The outlook for capital spending is beginning to shape up. Government economists, making estimates in advance of the mid-September report on plant and equipment by the Securities & Exchange Commission and the Commerce Dept., feel that plants' fourth-quarter plans are proceeding on schedule.

This means a pattern of some $37 billion in spending will hold up through this quarter and the last half of the year. There had been worries that some industries' spending, chemicals among them, may be declining. The preliminary evidence is to the contrary.

But there are now some worries about next year. Some economists feel that the nation may go through a dull, level period, before a new upturn occurs. There is belief, though, that the new Administration, whether Democratic or Republican, will psychologically create some new impetus.

•

U.S. trade with Communist countries continues to follow the pattern it has for some time. The Commerce Dept.'s latest periodic report on approval of licenses to export to Soviet Russia and its satellites shows that $24.5 million worth of goods was cleared in the second quarter of this year. This is $10 million below the total approved the previous quarter, and down $5 million from fourth-quarter '59. The total approvals, however, are still well above any previous period since '57. Requests for export licenses, on the other hand, fell to $27 million, the lowest dollar total since mid-'59.

One-shot exports, as well as imports, continue to characterize U.S. trade with the Communist bloc. Second-quarter '60 export license approvals—made up primarily of steel and textiles bound for Russia—also included $592,500 worth of butanol and $424,237 worth of carbon black destined for Russia and Rumania. Much of the rest is made up of agricultural shipments to Eastern Europe, particularly to Poland.

In addition exports of technical processing data and know-how to the Communist camp, particularly in synthetic textiles and plastics fields, also were approved. But this trade is limited to nonstrategic types of processes, which Commerce regards as not contributing to Communist military potential. Over $1.5 million worth of applications to export polyethylene, for example, were denied in the last quarter.

•

The Dept. of Defense's Advanced Research Projects Agency —ARPA—has launched a new advanced energy-conversion program designated Project Lorraine. The program will support basic research in new and novel approaches of energy-conversion.

Organic energy conversion will be the first project to be financed by the Lorraine program. Details of the study are being worked

out now. Actual contract letting will be done through the Air Force Cambridge Research Center. All told, ARPA is expected to spend around $200,000 a year in this field.

In handling the energy-conversion program, ARPA will work closely with the three military services, the Atomic Energy Commission, the National Aeronautics and Space Administration and the Bureau of Standards.

Selection of proposals to be supported will be done on a joint basis with all the agencies. The Rand Corp. will consult; Rand has a standing contract with the Dept. of Defense for just this type of study and evaluation. ARPA expects to finance about 50 projects on a continuing basis. As some are completed or dropped, others will be added.

The project is something that scientists have been wanting for some time. Up to now the bulk of effort going into energy conversion has been channeled into inorganic approaches. Taking the organic approach offers great potential, the scientists say.

•

The Navy is well on its way to developing a successful refrigeration system for submarines using thermocouples. Commercial use of the system hinges on how fast the CPI can develop processing techniques that will reduce the cost of metals used in the system.

The big need for such a system is noise reduction. A thermocouple refrigeration and air conditioning system is virtually noiseless with all gears eliminated. This has great value in reducing the chances of subs being detected by enemy equipment.

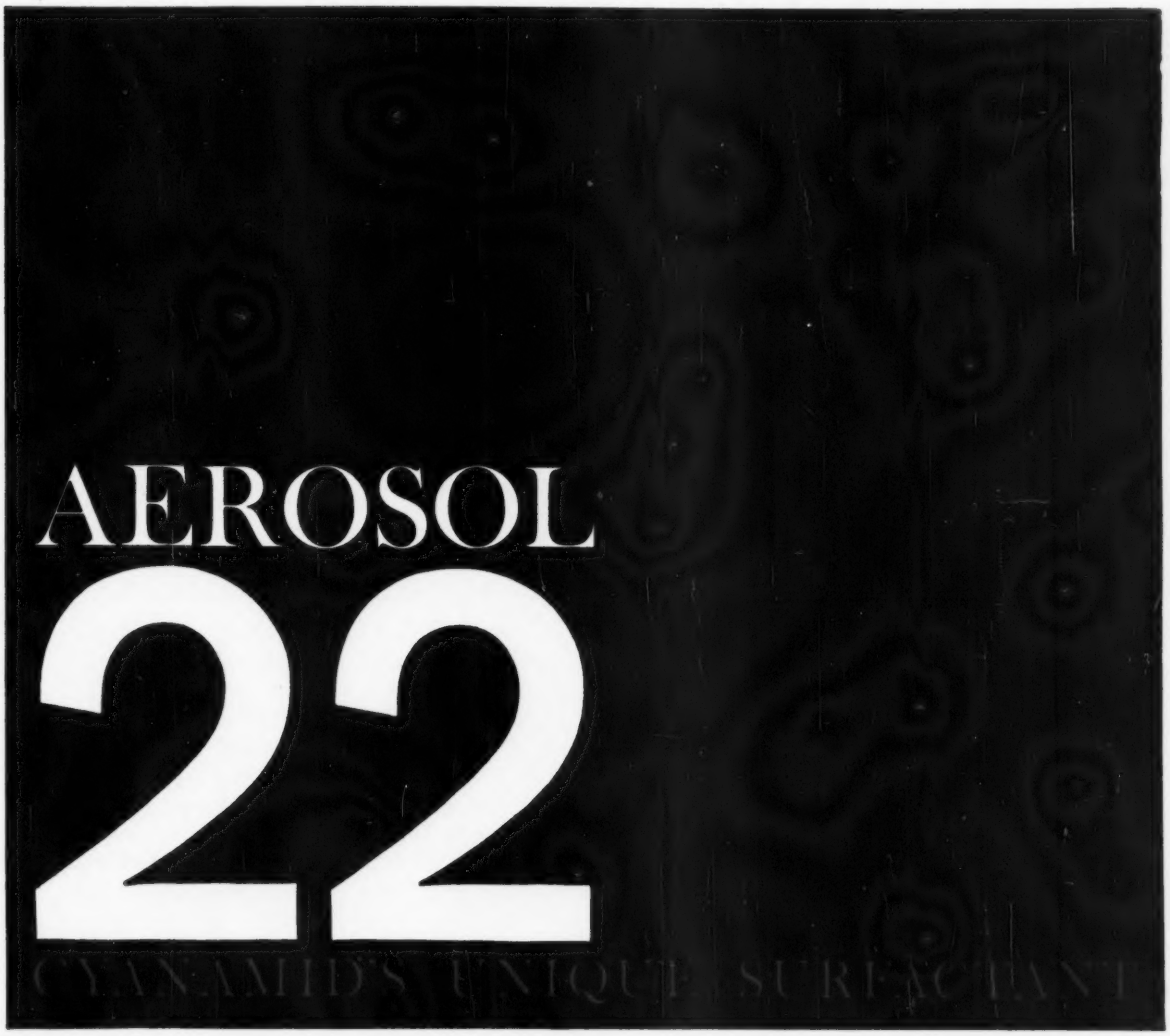
Cost of such a system will run several times the $200,000 for a conventional refrigeration system in a submarine, the Navy says. Right now, Navy scientists don't see much commercial use for the development. However, as the cost of such metals as bismuth and tellurium (which are being used in the thermocouples system) decreases through volume usage, industry may adopt the system.

Several companies are currently working under Navy contract on the refrigeration system, including Westinghouse, Carrier, York, and Whirlpool. At present, the Navy says it could build a workable system that would be one-quarter to one-third as efficient as a conventional Freon system. A working model is slated to be built soon, with actual installation in submarines likely within the next couple of years or so.

•

Plastics have gained another toe hold in the missile field. Hercules Powder Co. recently won a contract with the Air Force to build the third stage of its 6,000-mile-range solid-fueled Minuteman missile using a glass-fiber engine casing.

Hercules beat out Aerojet-General Corp. in competition for the contract. Aerojet proposed to build its engine casing with titanium as is now being done for the Polaris missiles.



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HERCULES POWDER

CHEMICAL WEEK REPORT

President Al Forster is flanked by former board chairmen Charles Higgins and Anson Nixon against background of new Hercules 'Tower' in Wilmington, Del.

The New Force at Hercules

A CW profile-in-depth of Hercules Powder—how an unusual management setup is building a new future on a solid foundation

Last week the Air Force revealed it had selected Hercules Powder as producer of the third stage of its ICBM Minuteman. This week the firm received a subcontract for the retro-rocket in the lunar capsule development program sponsored by the National Aeronautics and Space Administration. In the meantime Hercules has been quietly working on an alternate second-stage rocket motor for the news-making Polaris missile. These developments are among the reasons why Wall Street men are coming to a near-unanimous conclusion: the staid chemical giant is "going places."

Actually, however, what the man on The Street tends to overlook is that the firm has already made an enviable record for itself. Its growth—as reflected in both sales and profits—has closely paralleled that

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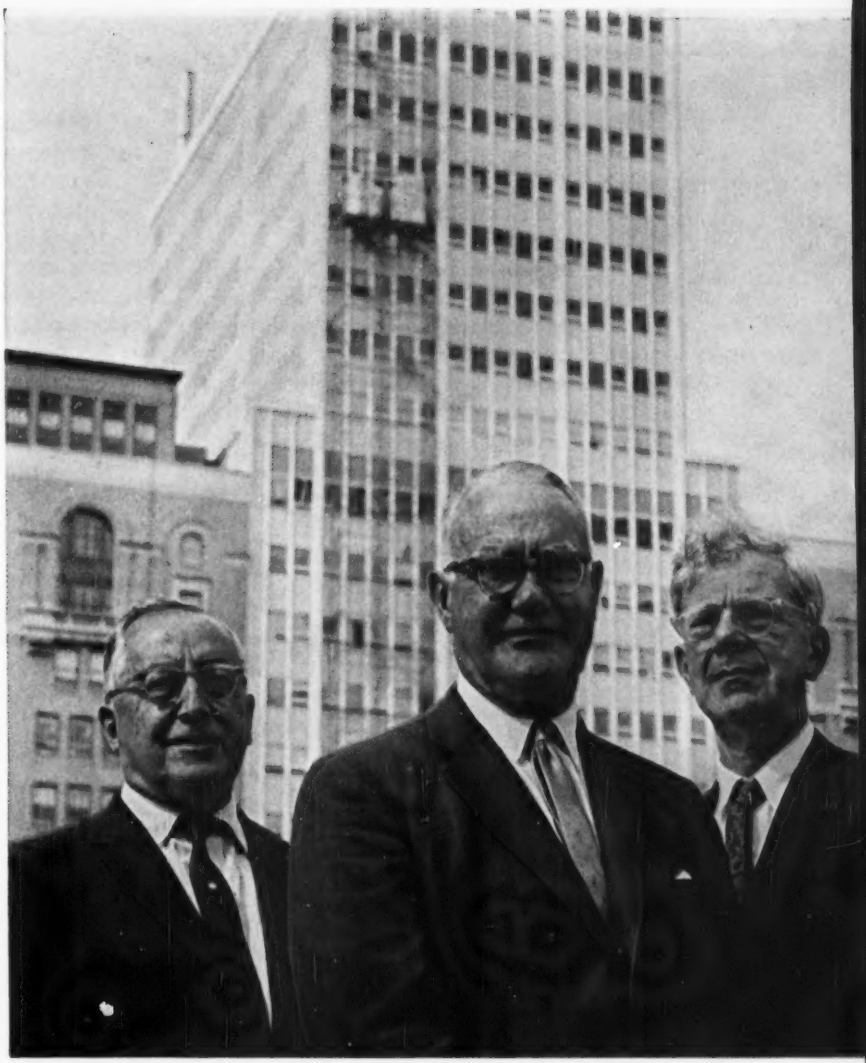

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of the fast-moving chemical industry as a whole (*see charts, p. 51*). Moreover, the firm is "going places" by four distinct routes:

(1) *A $50-million construction program,* the highest in the company's history.

(2) *Building overseas operations.* Last December, it created an International Dept., gave it full operational status. Within a three-week period in March and April, it revealed three new overseas moves.

(3) *Aquisition and merger.* In January, it took over Imperial Color, Chemical and Paper. It followed this up with a smaller acquisition in February, when it took over the Nitroform Agricultural Chemical Co. Its most recent negotiations—with Beaunit Mills—fell through (*CW Business Newsletter, July 2*). But that doesn't spell an end to possibilities of future major mergers. Textiles, in particular, either through acquisition or joint venture appear to be a likely, logical extension of Hercules' activities.

(4) *An aggressive search for* new products and technologies. Because of its success with polyethylene and polypropylene, it is especially eager to delve deeper into new polymers. Item: a new elastomer, a copolymer of ethylene and propylene, is in early field evaluation by American rubber companies.

Also, in addition to its work in rocket propellants, Hercules has done some highly imaginative work in atomic energy. Last year, for example, it disclosed its research on utilization of fission fragments to initiate chemical reactions (*CW, Dec. 19, '59, p. 74*).

THE FOUR ROADS TO PROFITS

Last year Hercules sales (net) amounted to $283.6 million, on which it earned a fancy $23.4 million. This year promises to be even better. First-half sales were up 17%, to $160.5 million; earnings up 10%, to $12.9 million.

The Hercules construction program plus the acquisition of Imperial should add about $70 million to the firm's sales potential.

But additional sales is strictly a secondary consideration with Hercules. President Al Forster's frequently stated philosphy: "We're not interested in getting big just for the sake of 'bigness'." In truth Forster is a card-carrying, doctrinaire capitalist. He's a lot more interested in profits and return on investment.

That type of thinking has typified Hercules' historic approach. It can be clearly discerned in present moves.

Building Up: Take its current construction program. All $50 million* is going into projects Hercules is convinced will be big money-makers. Largest part, for example, is being funneled into the new polypropylene plant at Lake Charles, La. Hercules management is decidedly bullish on prospects for both polypropylene and linear polyethylene. So far, at least, its optimism has proved well-grounded.

It's no secret that the U.S.'s capacity for high-density polyethylene has surged way out in front of demand. Last year industry capacity was 300 million lbs.; production came to less than 100 million lbs. But Hercules is not only able to sell all it can make; it also could use more capacity.

This happy circumstance is the result of two factors: the exchange-of-know-how agreement with Hoechst that enabled it to get off to a flying start with a quality product; and special attention to providing a resin suitable for blow-molded bottles.

The polyolefin project, however, has cost Hercules dearly. "We've put $30-40 million in plants and research," says Elmer Hinner, general manager of the Cellulose Products Dept., which has responsibility for polyolefins.

It will take some time to earn that money back. But Hinner and the others can already see returns. The firm's polyethylene (Hi-Fax) is established as the product of choice in blow-molded containers for liquid detergents because of its all-around toughness and resistance to stress-cracking. (Copolymers made by other producers, of course, are also suitable.)

According to Emmet Hixon, sales manager for plastics, liquid detergents will take 1 billion plastic units this year—a 50-million-lbs. market for linear polyethylene. The potential for liquid bleach containers, which so far has hardly been tapped, is even bigger.

All things considered, Hinner sees a total market for high-density polyethylene of 750 million lbs./year by '65.

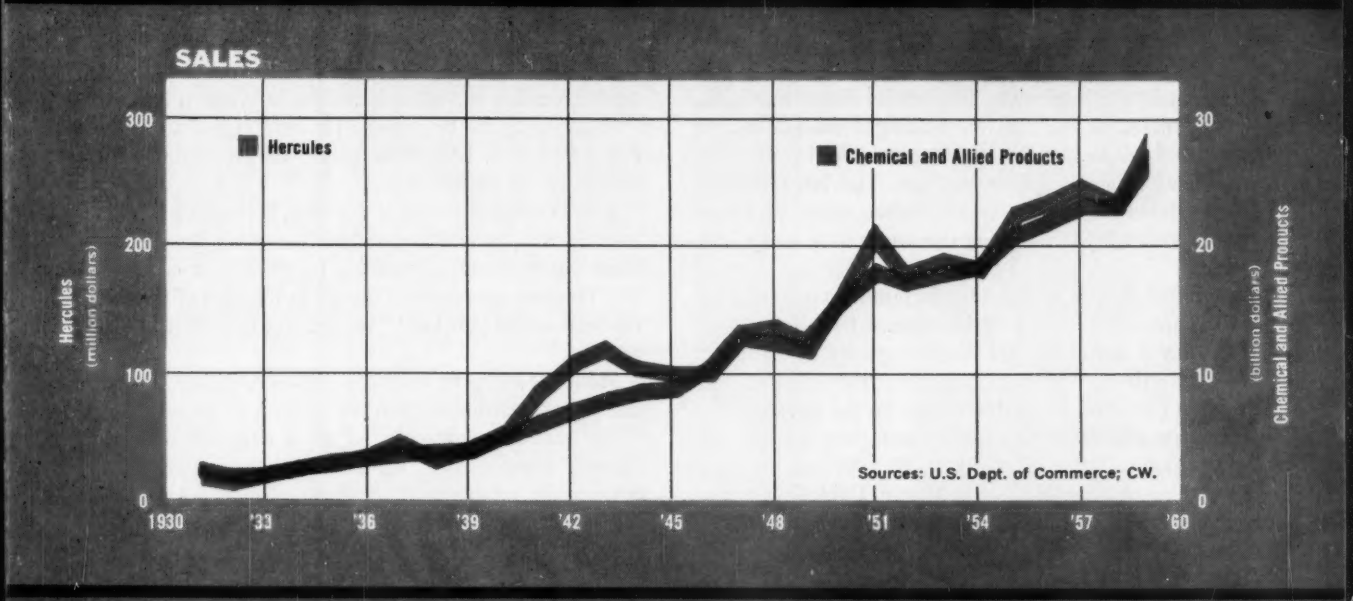
He sees a comparable market for polypropylene, which at the moment is Hercules' particular pride and joy. Management is by no means shy in boasting of its achievements in polyethylene, but it becomes almost lyrical discussing polypropylene. It signed an agreement with Ziegler in Sept. '54, launching the polypropylene program at the same time. Within 40 months, it was making polypropylene commercially.

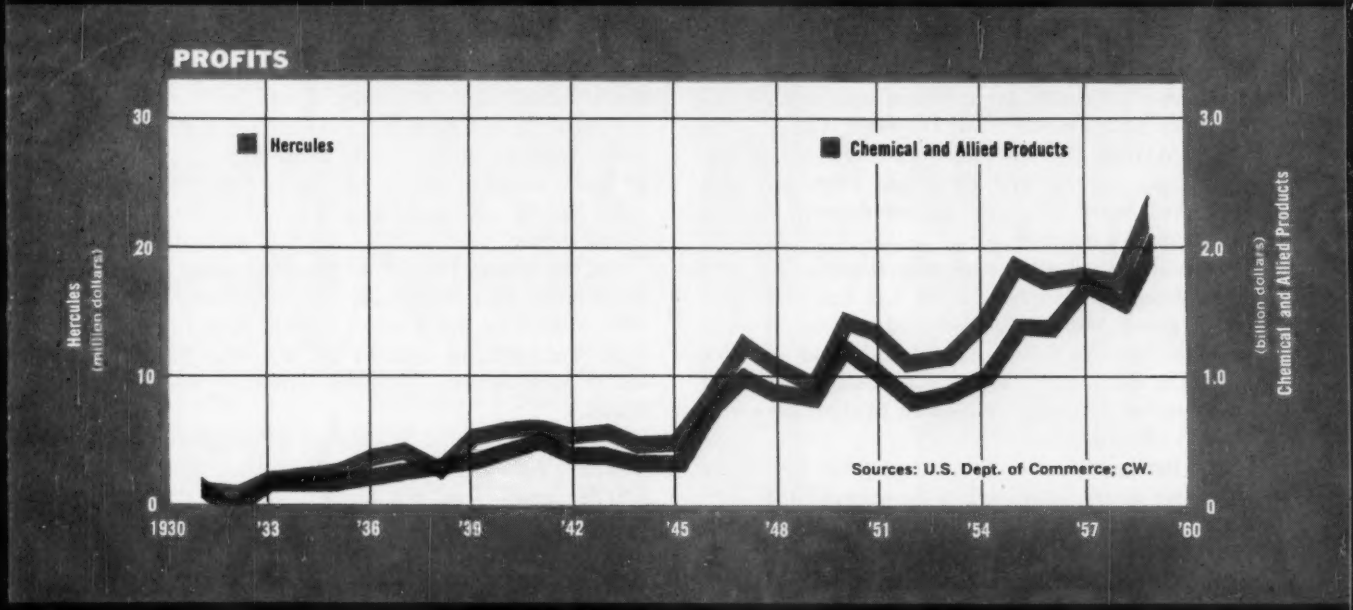
There has been considerable confusion surrounding Hercules' capacity for polyolefins and whether the plant at Parlin, N.J., consists of one or two units.

The facts: When the polyethylene plant was built at Parlin, extra engineering was built in, to enable it to produce polypropylene eventually as well. A second facility — the so-called polypropylene unit — was similarly designed and sized to produce either product. Experience has proved Parlin capable of making at least 60 million and possibly 70 million lbs. of combined products a year.

The Lake Charles plant will consist of two units, each of which is comparable to the full Parlin plant. The first unit will be completed early next year. The

* Roughly two and one half times the $20.8 million spent in 1959, three and a half times the $14 million spent in 1958 and a sizable amount over the previous high of $34.5 million in 1956.





second, when built, will give the firm a total polyolefin capacity of 180-210 million lbs./year.

For Fiber and Films: Second largest expansion program being undertaken by Hercules in the quadrupling of capacity for DMT (dimethyl terephthalate) at Burlington, N.J. This will give Hercules a yearly capacity of 48 million lbs. of DMT, used to make polyester fibers and films. At present, Hercules sells mainly to Canada (for Terylene). But U.S. firms (Tennessee Eastman, Goodyear, Fiber Industries) are expected to be growing customers, and Hercules sees a bright future for the compound.

For the DMT expansion, Hercules is sticking with the Witten†-California Standard process. Says Don Sheffield, general manager of the DMT-producing Synthetics Dept.: "It is certainly one of the cheapest ways of making DMT." His simple statement does more than reflect the firm's preoccupation with profit and return on investment; it explains why the Henkel process (*CW, April 6, '57, p. 32*) on which the firm spent sizable development sums is not used: while the Henkel operating costs were highly attractive, the required capital investment seemed too high to yield a competitive return on investment.

The third major construction project is being car-

† Formerly Imhausen, after the man who developed it. Witten later acquired rights to the process.

ried out by the Explosives Dept. at its Hercules, Calif., plant. Included: facilities for making 8 million gal. of methanol, 50 million lbs. of formaldehyde, 11,000 tons of urea-formaldehyde concentrates. The latter project is scheduled for startup this December, while the methanol-formaldehyde units are due for startup early next year.

At this site, too, Hercules is putting up a unit to make urea-formaldehyde (slow-release) fertilizer. And last May it decided to quadruple capacity for nitrogen tetroxide there. The market for tetroxide is strictly in rockets (the material is destined to be the storable oxidizer for the Titan II ICBM); and even quadrupled production will be relatively small total output. "It's something of a gamble," Jack Martin, Explosives Dept. general manager, says. "We can do it for a modest investment. We don't stand to gain a lot but we can't lose much either."

Rounding out the corporate construction program are a 5-million-lbs./year plant for making Penton, the firm's new chlorinated polyether plastic; a tall oil fractionation plant in Canada; and extra capacity for CMC (carboxy methyl cellulose) at Hopewell, Va.

Eyes Abroad: Overseas interests are by no means new for Hercules. It has had an Export Dept. for some time. And export sales have accounted for 14-15% of the company's net sales.

In addition, it has operated several overseas plants. In England, Hercules Powder Co. Ltd. has two wholly owned plants, owns 50% of a third, and one-third of a fourth. Hercules Powder Co. (Canada) Ltd. operates a plant at Burlington, Ont. Corbu Industrial, S.A. has an operation at Ciudad Hidalgo in Michoacan, southwestern Mexico.

But the formation of the International Dept. was more than simple recognition of the present importance of this business. It was also an acknowledgement of the potential. Putting it on a level equal to that of its seven operating divisions is only one indication of the seriousness with which management is tackling the problem. The other: appointment of Henry Thouron as its general manager. Thouron is a board member and was general manager of the Synthetics Dept.

Soon after he took over his new job, Thouron revealed three new projects: (1) formation—with A. C. Hatrick Pty., Ltd.—of Hercules Powder Co. (Australia) to make and sell rosin products, other industrial chemicals in Australia; (2) a wholly owned subsidiary in Sweden (Hercules Kemiska Aktiebolog) to make rosin size in a new plant there. Eventually, the new company is expected to turn out a complete line of paper chemicals; (3) a plant at Zwijndrecht, Holland, by a previously organized subsidiary, N. V. Hercules Powder. To be completed during the second quarter of next year, the plant will make chemicals for the paper, protective coatings and other industries in Western Europe.

That's only the beginning. Thouron says that, in the Far East alone, he's investigating 16 propositions for new plants or partnerships.

For its original overseas ventures, Hercules has been sticking with its well-established line: rosin derivatives, other paper chemical products for protective coatings. But Thouron sees no restrictions on the type of venture the firm would consider: "We are not beholden to any product."

Matter of Mergers: Hercules management flatly denies that it has any master plan for mergers or acquisitions. "The business philosophy is in a constant state of change," Forster says. "We have to keep examining our position in relationship to those changes. Any new endeavor must be logical."

He may protest too strongly. It's fairly easy to uncover at least a broad pattern to Hercules' moves in this area. Its early acquisitions were clear-cut attempts to diversify. This policy has been so successful that no single industry accounts for more than 15% of the firm's annual sales (*see chart, p. 53*).

Hercules is still interested in establishing itself in new fields. Evidence of this can be found in its acquisition of wheat-processor Huron Milling in Dec. '56. (Hercules had, of course, been in the food field to some extent through sales of cellulose gum, purified CMC.)

But the driving force now is building up on present bases rather than finding new ones. For example, Hercules has always had a strong hand in protective coatings. Acquisition of Imperial last December gave it a line of basic pigments—complete except for blacks and whites.

Further example of building on an established base was the purchase of Nitroform. Hercules originally got into fertilizers to sell the nitrogen solutions that were by-products of its ammonium nitrate explosives manufacturing. Nitroform's slow-release nitrogen compounds ("urea forms") give it another entry in the field.

Beaunit, too, would have been a case of building up instead of building out. It would have given Hercules a captive outlet for its chemical cellulose (which Beaunit uses to make Tyrex tire cord). Possibly even more important it would have helped weave polypropylene's fiber future.

Hercules management is convinced that polypropylene has real potential as a fiber. But to achieve it takes experience the firm simply doesn't have. Other fibermakers, of course, are working with the material. But obviously their incentive is not so great as it would be if they had a share in the production of the resin—nor will Hercules benefit so greatly as it would if it owned a share of the fiber-making firm.

Another incentive to tying in with a fiber-maker would be to help Hercules out of a potentially uncom-

fortable position in DMT. The customers for DMT and the xylene suppliers as well are potential competitors. (Amoco and Standard of California supply DMT from their own xylene and, of course, Du Pont makes its own DMT from paraxylene.) With the refiner integrating forward and the fiber-maker integrating backward, a firm like Hercules could well end up holding a wash-and-wear polyester bag.

Hercules professes no concern about this. Says Vice-President Paul Mayfield: "It's an old-fashioned idea, I know, and it probably sounds trite. But we just think it's nice to buy something from someone and sell things to someone else." He is using "nice" somewhat as a euphemism for "profitable," for that approach has worked fine for Hercules in the past.

Moreover, it's extremely unlikely that Hercules with its background in DMT would find itself locked out of the market. But the pressure could be felt in profits. Its effort with the Henkel process (which starts with benzene rather than xylene) was certainly an attempt to eliminate reliance on refiners for raw materials. Having a fiber business might be an even better solution.

The advantages of a textile tie-in were in evidence as far back as '56, when it conducted preliminary negotiations with American Viscose. That, like the Beaunit deal, fell through. But, with so much to gain, Hercules will likely be extra-attentive to propositions in textiles—acquisitions, mergers or joint ventures.

Accent on Polymers: A pioneer in cellulosics, Hercules is proud of its polymer chemists. "They're as good as anyone's," Hinner says. The fact remains, however, that its over-all position in polymers is not as solid as might be expected. It never did get into large-volume polystyrene or vinyls, for example.

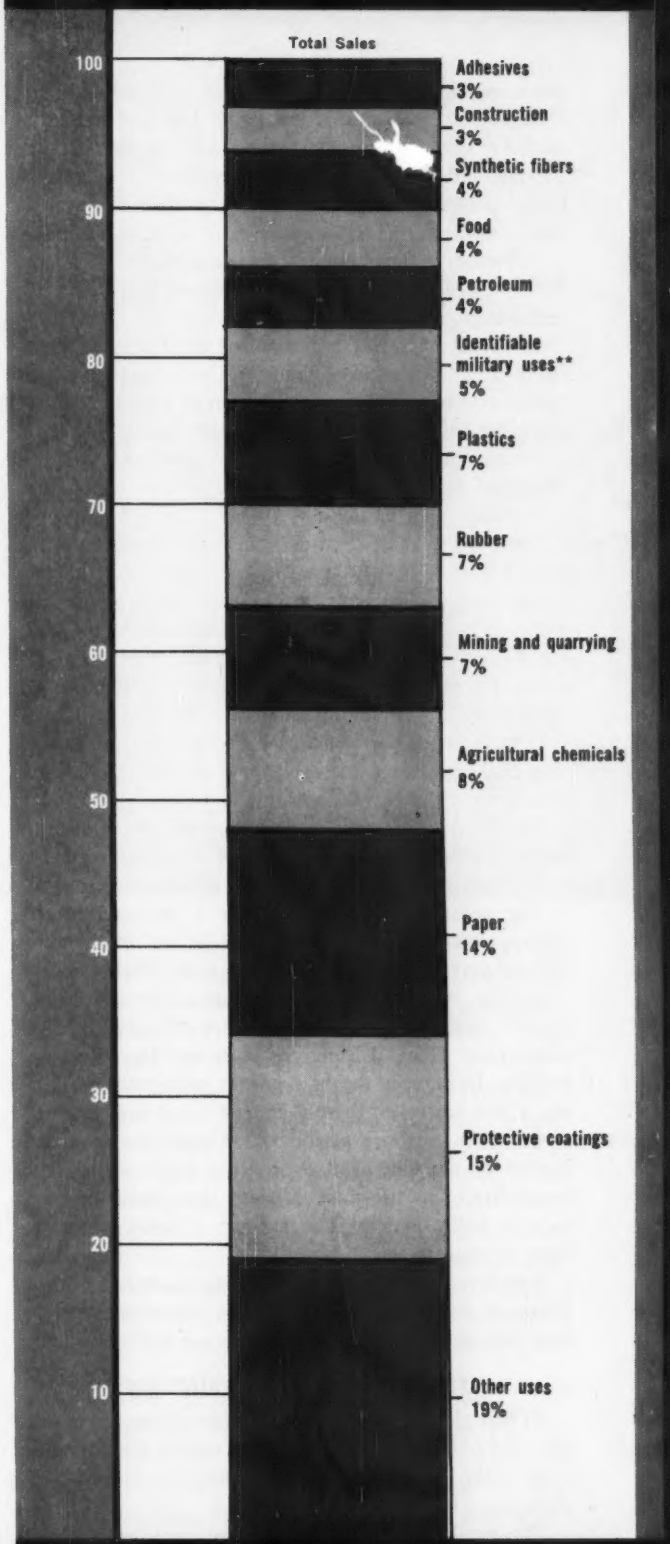
It is, however, making up for lost time in polyolefins. With polyethylene and polypropylene well-launched, it is quietly working on copolymers. Not very much is known about its new ethylene-propylene elastomeric copolymer now under field evaluation. But it is not a specialty rubber. It's believed to have properties intermediate between SBR and the new "synthetic naturals." It is being aimed at the big-volume tire outlets.

Penton, the new chlorinated polyether, is another example of the firm's recent efforts in polymers. It's being aimed at corrosion-resistant applications where it's expected to fill the gap (in properties and cost) between polyvinyl chloride and the fluorocarbons. Right now Penton sells for $2.50/lb., but price will come down somewhat. Its advantage over fluorocarbons is that it can be molded in conventional thermosetting equipment.

Atoms and Rockets: Although Hercules may have been a bit late in recognizing the possibilities of synthetic polymers, it's been anything but slow in carving

Sales: Many Eggs, Many Baskets

How Hercules Sales* Break Down by Industry



Year: 1959 * Including fees for operating ordnance plants for the government.

out a spot for itself in atomic energy and rocketry.

In the field of atomic energy, it has had men stationed at Oak Ridge and Argonne. Its work on harnessing rebound energy for chemical synthesis was entirely financed out of company funds. Commercialization of this is at least 10 years distant. And, if it is successful, it will require financial support from the government. But it does illustrate the firm's broad view on new technology.

In rockets, interest has centered on development of solid, double-base propellants. (Its only excursion into liquids has been through production of nitrogen tetroxide.) Under the direction of Lyman Bonner, director of development for the Explosives Dept. and a highly respected figure in the rocket field, it has made some substantial contributions.

Much of the publicity on solid-base propellants has been concerned with so-called composites—a rubbery binder into which an oxidizer such as ammonium perchlorate is compounded. In the classical double-base (or homogeneous) propellant, a mixture of nitroglycerin and nitrocellulose, the oxidizer (the nitro group) is an integral part of the molecule. Hercules has been able to improve performance by adapting a souped-up propellant and by using a plastic case that appreciably lowers the weight of the system.

To get more energy into the propellant, it uses a sort of hybrid system—the double base serves as binder into which additional oxidizer (perchlorate) is mixed.

The plastic case, Spiralloy, is a glass-reinforced epoxy, which is strong because the "grain" of the glass fibers layers are at right angles to each other.

Civilian markets for rocket products are, of course, hard to find right now. But Hercules officials see some developing. General Manager Martin of Hercules' Explosives Dept. sees the high-energy propellant as finding a job wherever there's a need for a big surge of power over a short period. Al Giacco (pronounced Jocko) of the Chemical Propulsion Unit can see the possibility of its use in a cartridge that would be used to start balky motors. The military is using it now to start jet engines.

Spiralloy is already finding civilian markets, in fabrication of equipment parts where its exceptional toughness and good dielectric properties are useful.

THE MANAGEMENT STRUCTURE

At first glance, Hercules' management structure looks like that of any one of many other chemical companies (*see chart, p. 58*). On closer inspection, however, there are some striking departures.

The similarities arise because the company's board of directors has delegated considerable authority to an executive committee and a finance committee.

Forster is chairman of the board, president and chairman of the six-member executive committee. He's also a member of the finance committee.

Chairman of the finance committee itself is Vice-President Edward B. Morrow, who, in terms of service with Hercules (44 years), is the oldest member of the executive team.

The management group under Forster consists of five vice-presidents, a secretary and assistant secretary, a treasurer and five assistant treasurers, the general managers of the eight operating departments and the directors of the 10 auxiliary departments (research, advertising, personnel, traffic, legal, etc.). Offices of both the secretary and treasurer are also considered auxiliary departments.

General managers have complete responsibility for the profit pictures of their departments. They have complete autonomy regarding production, sales and research. Similarly, heads of the auxiliary departments are offered considerable latitude in their operations. Their budgets are prorated over the operating departments.

Points of Departure: The main differences in Hercules' organization is that it violates two important rules of modern management practice: it has a completely "inside" board—members have specific operational jobs, and belong to no other boards—and the vice-presidents have no formal areas of responsibilities.

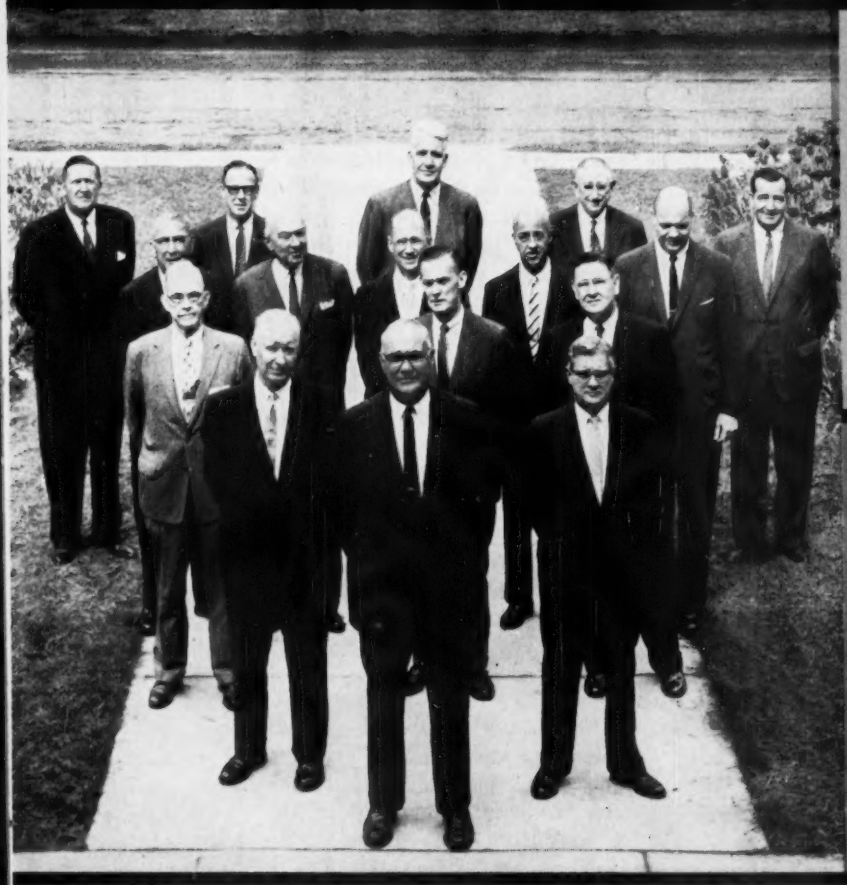
To all criticisms of its system, Hercules has a two-word answer that is hard to rebut: it works.

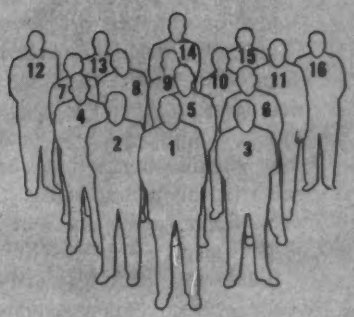
Moreover, the organization isn't nearly as loose as the chart might indicate. While the vice-presidents have no formalized areas of responsibilities, they have recognized "spheres of influence."

Morrow, for example is the financial and tax man. Wyly Billing, who had been assistant director of the Research Center and, later, head of Synthetics, takes a particular interest in research. John J. B. Fulenwider's background is engineering and Cellulose Products (where he was general manager). He looks after such subjects as engineering, production and safety. John R. L. Johnson, formerly general counsel, keeps tabs on patents and Washington developments. Paul Mayfield's specialty is sales and Naval Stores.

The board consists of these officers, several other staff men (*see chart*) plus most general managers. Hercules management men candidly admit there are some potential hazards in the "inside" setup. But so far none has erupted. And as far as their own company is concerned, they are convinced that there are some strong arguments in favor of such organization.

Primarily, they feel, it makes a governing body that fully understands the problems and concentrates entirely on them. Forster feels so strongly about this ability to concentrate on Hercules that he discourages members from sitting on other boards.





1. Albert E. Forster, president and chairman of the board
2. John R. L. Johnson, Jr., vice-president
3. Paul Mayfield, vice-president
4. Leon Babcock, personnel director (retired this month)
5. G. Fred Hogg, general manager, Naval Stores
6. John E. Goodman, treasurer
7. Elmer F. Hinner, general manager, Cellulose Products
8. Wyly M. Billing, vice-president
9. John J. B. Fulenwider, vice-president
10. J. H. Tyler McConnell, secretary
11. John M. Martin, general manager, Explosives
12. Edward B. Morrow, vice-president
13. John H. Long, general manager, Paper Makers Chemical
14. Robert W. Cairns, director of research
15. Arthur F. Brown, general manager, Imperial Color
16. Edward G. Crum, general manager, Virginia Cellulose

*Not shown, Henry Thouron, general manager, International.

There is never a problem in getting the board together. "We could convene in five minutes," says Mayfield, "if the elevators are running right."

General managers generally are advanced to board membership, where they have a voice in corporate policy. President Forster puts it this way: "Since they are responsible for profit-and-loss statements of their departments, they should have a chance to express their opinions—and to vote—on decisions that affect them."

Moreover, many potential interdepartmental hassles are eliminated, since a general manager sitting on the board, almost of necessity, is thinking in terms of broad corporate, rather than narrow departmental, welfare.

Of course, the general manager and his department stand to gain, too; he might be refused funds for a capital expansion project by the executive committee. He can—and occasionally does—take his request to the board, where it's possible to get a reversal of the executive committee's decision.

Works Both Ways: All these things have been weighed by Hercules, since it's aware it is in the minority in having an inside board. (The National Industrial Conference Board survey showed that only 4.5% of industrial firms had completely inside boards.)

J. H. Tyler McConnell, Hercules secretary, points out that while Hercules may be in the minority it's in pretty fair company (e.g., Standard Oil of N.J.). What's more, he notes, many companies whose boards qualify as "outside" have only token membership from people not actively working in the company.

A noted management consultant corroborates McConnell's faith like this: "Usually the two (inside board and an organization in which the vice-presidents have no clear-cut responsibilities) go together. It's the 'one big happy family' approach. We would certainly never recommend that any company switch to that type of organization. But if it is working well, we would not think of recommending a change away from it either. The important thing is that to work well, the relationships between the people have to be exceedingly harmonious."

One for All: Harmonious relationships between its people is certainly one of Hercules' long suits. There's a close-knit friendship, spirit of camaraderie that would be hard to duplicate. It permeates all echelons of the company. In fact, the atmosphere is so pronounced that harsh critics call the company paternalistic; Hercules people are convinced it's something a lot deeper than that.

How did it come about? Forster explains it like this:

"Most of our key people started in the Research Center. We look them over carefully before we hire them. While they're there, we get to know them pretty well and they get to know us. Before anyone is moved, there's a sound basis of mutual respect and friendship. Another thing: we've been able to be selective, unhurried about our hiring. Except during the wars, we've never had to rush out and hire a whole group of new men."

Billing feels that a primary reason for the atmosphere is good communications. Fulenwider thinks it's simply a case of enlightened management. "I've always had the feeling that I've been well-led here," he says.

Another theory advanced by some is that it all derives from the nature of Hercules' original line, explosives. The hazardous nature of the business bred an unusual kind of fellowship and this has carried over to the other departments.

Auxiliary Departments: The auxiliary departments operate largely in a staff capacity. In negotiating labor contracts, for example, the personnel department advises the plant management. "But the plant managers have to make the decisions themselves," says Clark Kingery, who is the director of personnel. "After all, they are the ones that have to live with the deal."

In some areas, it's hard to pinpoint where the line organization stops and the staff starts. Research affords a case in point:

In keeping with the rest of the chemical industry, Hercules is building for the future on research. Its total bill is approximately 4.5% of sales, slightly higher than that of the industry as a whole. This year it's spending $13 million. (This includes fundamental and applied research and technical service, pilot planting and other expenses up to commercial production.)

Most of this ($7 million this year) is spent at the Research Center near Wilmington. Built in '30, the center was one of the first centralized facilities in the industry. But it isn't "central research" in the usual sense.

All the people at the Research Center are employees of the research department and come under the administration of Robert Cairns, research director and a member of the board. However, decisions on projects on which they work is up to the general manager of the operating department that is paying for it. "We have," Cairns explains, "completely centralized planning coupled with decentralized execution."

Every two or three months, Cairns and members of his department sit down with three or four executives from the operating department (including the general manager and his director of development). At these times, they measure progress and hammer out plans.

Engineering Buildup: Another area where the gap between an operating and auxiliary department narrows is engineering. Operating departments have sole responsibility for operations of their plants. But the engineering department is staffed by a group of specialists in power, instrumentation, safety and other engineering aspects. So the operating department frequently calls on engineering for help in cost-cutting programs. Safety men in the engineering department are concerned solely with design of new facilities and with providing safety information to customers.

If the firm is buying a plant from an engineering contractor, the engineering department is invariably called in to act as liaison. Its prime function, however, is to handle the complete design of new plants.

The large building program this year is keeping the department operating at full tilt. George Ripley, chief engineer, has been able to ease the strain by hiring relatively inexperienced people, moving others up.

He has been able to get help from the outside, too, without adding to the staff. At the Lake Charles polypropylene plant, for example, Bechtel handles design of the office and laboratory, while Hercules concentrates on process design.

48 YEARS OF GROWING

Hercules was organized in Oct. 1912, as a result of the historic federal court decision against Du Pont in an antitrust suit. In effect, Du Pont's share of the market was reduced from 80% to 50% and two new firms were set up—Hercules Powder and Atlas Powder. Each had about 15% of the market.

Hercules started business in Jan. '13, with six black-powder and nine dynamite plants. In Europe at the time, the clouds of war were already being seeded. It was possibly a bad time for anything—except starting an explosives company.

Hercules made the most of it. All the cordite made in the U.S. for the British government during World War I was made at Kenvil, N.J., by Hercules. To do that, it had to have a new source of then-scarce acetone. So, with U.S. Industrial Chemicals, it designed a plant at Curtis Bay, Md., for making it from acetic acid. The nation's acetone capacity jumped to 1.9 million lbs./month from a prewar high of 500,000 lbs./month.

Explosives Dept.: Production of Hercules' explosives is now the domain of the Explosives Dept. But the department bears little resemblance to the original company. All six of the black-powder plants have been liquidated; the property has been retained. The department's biggest installation is the Louisiana, Mo., plant purchased from the government in '54. At that plant it produces ammonia, methanol, formaldehyde and pentaerythritol.

The department operates the ammonia-from-coke-oven-gas plant at Tarrant, Ala., owned by Ketona Chemical, the joint offspring of Hercules and Alabama

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HERCULES POWDER

By-Products. It is also responsible for the firm's work in rocket propellants.

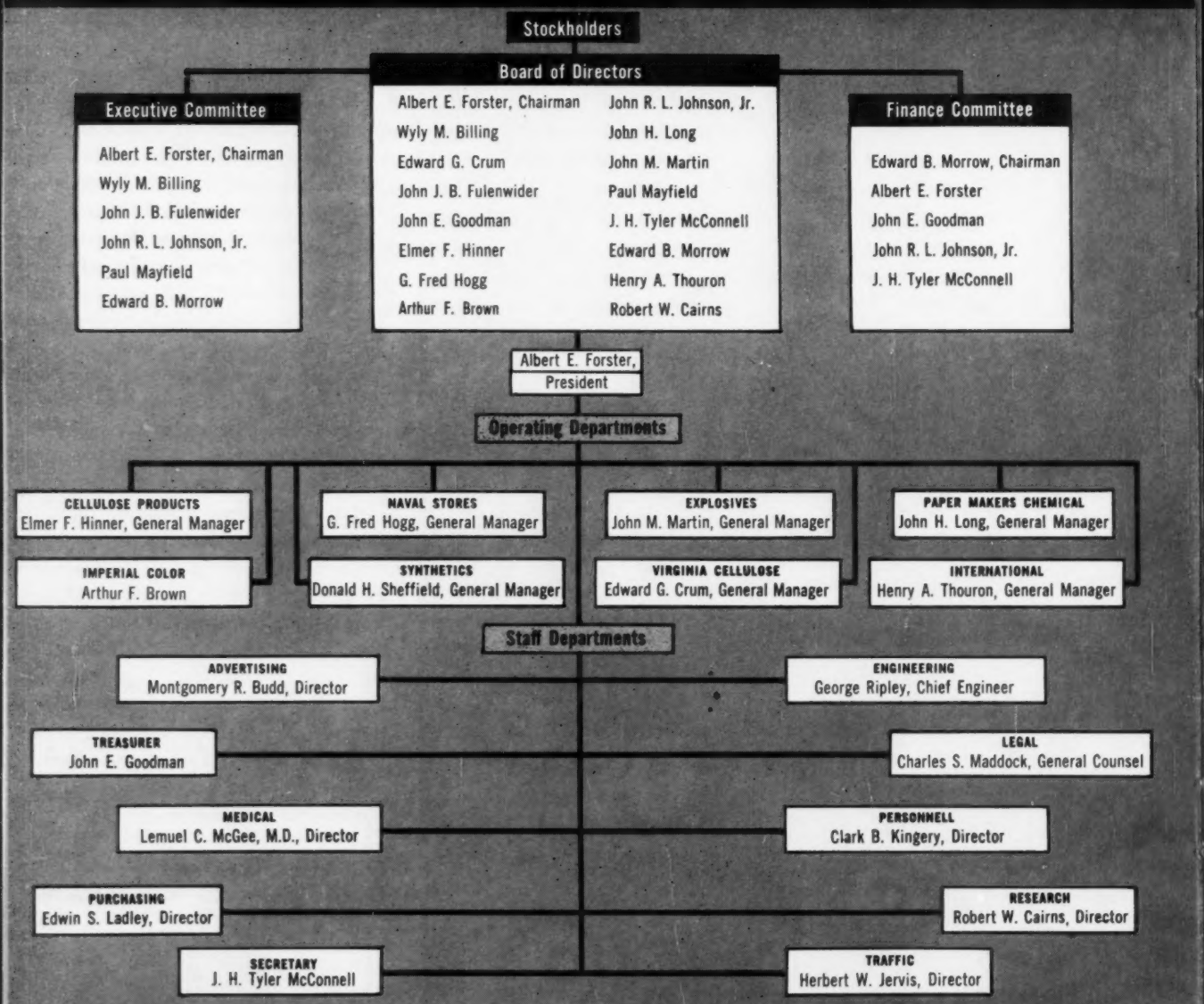
But its main business continues to be dynamite, and industrial explosives contribute over half the department's profits.

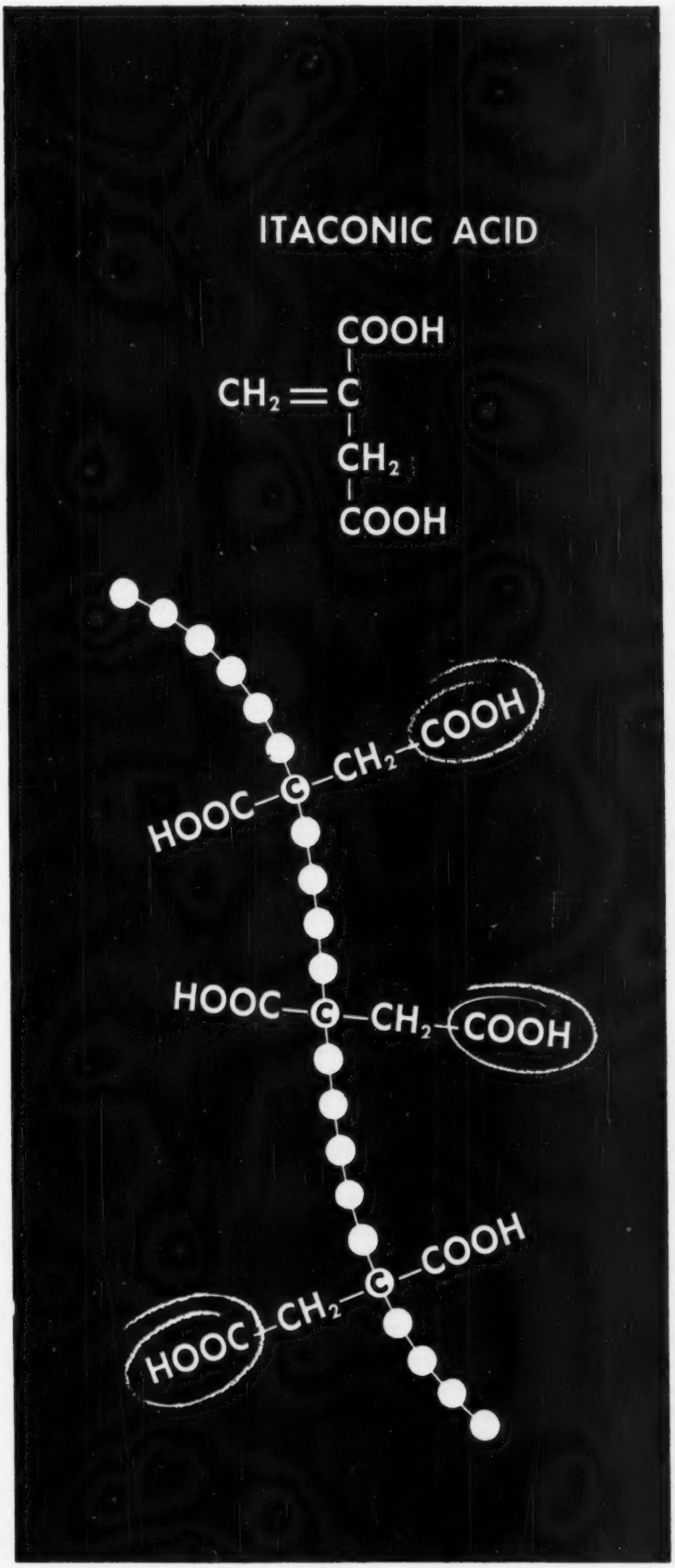
The 1-billion-lbs./year market for industrial dynamite breaks down into four categories, each of which takes about one-fourth of the industry's output: coal mining, metal mining, construction and seismic exploration and quarrying. Du Pont still takes the biggest slice. Hercules claims second. (So does Atlas.) In any case, the three account for at least 60%, and possibly 70%, of the total.

Although explosives are still a highly profitable line for Hercules, the business simply isn't what it used to be, because of serious inroads made by ammonium nitrate prills. The competition from prills stemmed from two factors: (1) the overbuilt nitrogen industry was eager to push nitrate into new outlets; (2) drills were developed to make the dry, smooth-bore holes needed for the nitrates.

In some ways, the new blasting techniques were

How Hercules Is Organized





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cruder than those developed around dynamite. But the ammonium nitrate is markedly cheaper.

"It's like painting a house," says Jack Hayes, assistant general manager, "The homeowner may not be able to do the professional job that a professional painter can. But he can do it cheaper. And he may be happy to sacrifice that extra, fine look."

Because prills are a "do-it-yourself" item, it's hard to pin down how much business explosives have actually lost. Martin estimates prills now have 75-85% of open-pit mining business and that some 30-40% of the explosives business has been taken over by firms not identified as explosives manufacturers.

As for the dynamite manufacturing, Martin says, "We're doing the obvious—automating as much as we can, cutting costs wherever it's consistent with safe operations."

The expected rate of growth of commercial explosives is 2-3%/year and Hercules will probably hold onto its share of that growth. Any faster growth for the department will have to come from its industrial chemicals, its slow-release nitrogen fertilizer, Spiralloy plastic or from rockets.

Cellulose Products: When World War I ended, Hercules found itself with a large capacity for nitrocellulose, a product that had almost no peacetime market. The firm started to probe for new outlets and found them in photographic films and, most important, in lacquers.

The young automotive industry turned to nitrocellulose for its quick-drying lacquers, and sales soared. For Hercules, it was like having a long-term mining lease to Fort Knox. Equally important, the success of nitrocellulose was a major factor in encouraging the firm to try its skills on other cellulose chemicals.

Nitrocellulose is now handled by the Cellulose Products Dept. The gold-strike in automobiles has petered out because of the development of new acrylic coatings. But the nitrocellulose market history has always been lose one, win one. "They've had us out of the business at least three times," says General Manager Elmer Hinner. "Something," adds Werner Brown, assistant general manager, "always comes along to save us."

This time the "something" is the fast-growing multicolored lacquers based on nitrocellulose. Nitrocellulose lacquer continues to hold its dominant position in furniture finishing, car refinishing and undercoating. "In a good month," Hinner says, "we sell as much as we ever did."

Prospects for output of Cellulose Products: normal growth for nitrocellulose and other established products such as Parlon chlorinated rubber; a somewhat quicker tempo for new products like Penton. Biggest opportunity for growth is in polyolefins.

Naval Stores: Hercules' efforts during the first war had filled the company coffers to overflowing and had given it background in organic chemistry. It also taught the firm the value of having a multiplicity of products.

While nitrocellulose was showing encouraging signs, the firm was still looking for places to invest its money and know-how. About that time, the U.S. Dept. of Agriculture concluded that the country was in danger of running out of gum rosin. Hercules decided the time was ripe for a naval stores venture and, in '20, set up a plant to extract rosin and turpentine by steam-distilling pine stumps. Later that same year, it bought out the Yaryan Rosin and Turpentine Co.'s plants in Georgia and Louisiana to become the largest naval stores producer in the world.

It turned out that the Dept. of Agriculture had overlooked the possibility of second-growth timber. The country never has run out of gum rosin. But, for better or for worse, Hercules was in the naval stores business.

For a long time, it was strictly "worse." Wood rosin didn't compete with gum rosin from the standpoint of quality. It was darker, tended to crystallize, had a lower melting point. For eight or ten years, it was a money-losing proposition.

But Hercules improved color with a new refining process; it learned to hydrogenate to boost other qualities and developed new techniques to hike yield. Naval stores have never been generally regarded as glamorous products. But for Hercules, they've grown at a rate almost four times the gross national product. And that includes the early period when they operated in the red.

The Naval Stores Dept. is now broken down into three segments—pine chemicals, agricultural chemicals and oxychemicals:

- The problem in pine chemicals is that the supply of stumps is limited. For reasons that nobody quite understands, the only ones suitable for extraction are first-growth pines. Just lately, alarms have been sounded that stumps are getting harder to find and that production of wood rosin is starting to fall off. G. Fred Hogg, general manager of Naval Stores, takes vocal issue with this: "Sure, stumps are going to run out eventually. But we've looked at this closely and we feel . . . there will be no noticeable decline for 10 years at least. As a matter of fact, we plan on being in the wood rosin business for a good, long time yet."
- Secret of Hercules' success in naval stores as in other fields has been its ability to develop and market derivatives. That's how the agricultural division of Naval Stores was born. Its biggest accomplishment was development of toxaphene from camphene; its latest: Delnav organophosphate miticide. Says Hogg: "We'd like a good fungicide and a good herbicide now. We're trying to upgrade toxaphene too."
- The oxychemical division grew out of Hercules' work on the oxidation of terpenes. The payoff was discovery of how to step up the oxidation of cumene

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to cumene hydroperoxide and the famous "cleavage" reaction to form phenol and acetone. Hercules, of course, uses this at its Gibbstown, N.J., plant. And in addition, it has put the technique to work making paracresol from cymene. It's also the basis for production of Di-cup dicumyl peroxide and Dalpac ditertiary paracresol. The goal of the oxychemical division: expansion of activities by upgrading phenol, finding new products.

Virginia Cellulose: Hercules depends on cotton linters for preparation of chemical cotton. The linters—short fibers left on the seed after the long staple fibers have been removed in the cotton gin—were a nuisance to processors of cottonseed oil. But Hercules was buying large quantities and, in '26, bought out its supplier, Virginia Cellulose Co.

Chemical cotton soon found an outlet in the then-budding rayon industry. (Its biggest outlet now is in viscose rayon for high-tenacity tire cords.) New markets were also found for it in ethyl cellulose and later CMC.

Virginia Cellulose had been relatively static. But the acquisition of Huron Milling pumped new life into the division. In addition to its desire to build up its business with the food industry, it gave Hercules a chance to try some of its talents on new chemicals. Says Ed Crum, general manager of Virginia Cellulose: "Starch has the same molecular configuration as cellulose and we wanted to apply some of our chemistry to it. Another consideration: at 4¢/lb., it is a cheap source of organic chemicals. That's 6¢/lb. cheaper than wood."

With Vicrum, Hercules now has over half of the booming vital wheat gluten business. In bakeries, for example, flours formerly had to be blended carefully to get the proper protein. Now it's just a question of adding vital gluten to any flour. The new high-protein cereals are helping too. One consists of 20% vital gluten; another, 35-40%.

Crum is enthusiastic about the prospects for Huron Milling's products because of increased emphasis on protein and balanced diets. But he's not overlooking the possibilities for cellulose products. New food uses are cropping up for cellulose gum. In the new, easy-to-prepare cake mixes, the cellulose gum makes the cake stay fresh longer. Natrosol, water-soluble hydroxyethyl cellulose, is now being produced on a pilot scale. In fact, water-soluble compounds are some of the brightest stars in Virginia Cellulose's future.

Paper Makers Chemical: Sales of rosin to the paper industry encouraged Hercules to purchase Paper Makers Chemical Corp. in '31.

The department now consists of three divisions—paper chemicals, tall oil and rubber chemicals:

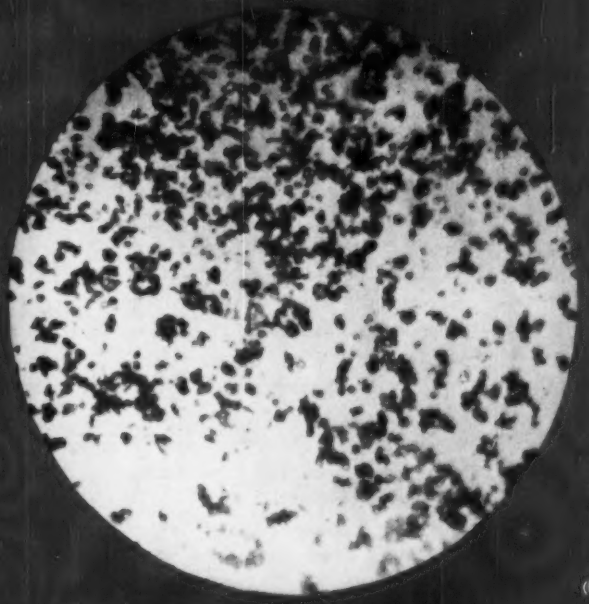
- The paper chemicals division encompasses the products of the original Paper Makers Chemical, defoamers, rosin size, etc. It's still the largest in the department in terms of tonnage. Its philosophy, as expressed by John Long, general manager of the depart-

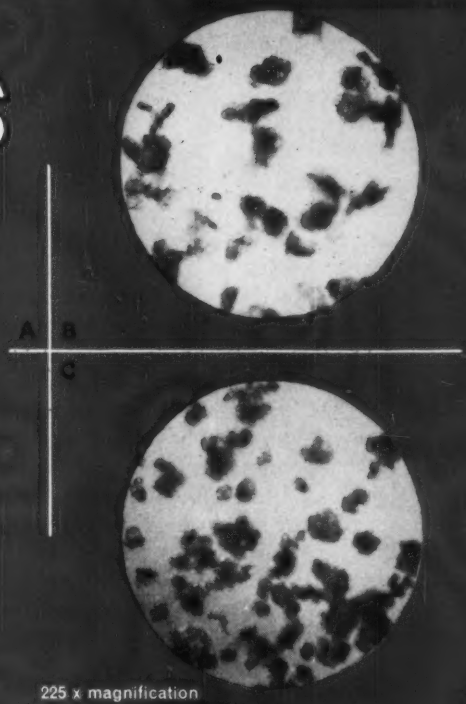
Executive committee in session: (l. to r.) Mayfield, Fulenwider, Forster, Morrow, Johnson. (Not shown: Billing).

INTRODUCING

FLEXICHEM CS

...BY SWIFT





225 x magnification
Scale 1 mm = 4.4 microns

The photo micrographs indicate how FLEXICHEM CS (A) compares in size and uniformity to typical samples of commercially available 325-mesh calcium stearates (B and C).

New, extra fine calcium stearate promotes surface coverage

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FLEXICHEM CS

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Type of salt:	Di
Physical form:	Impalpable powder
Particle size:	20 microns maximum
Color:	White
Formula:	$Ca(C_{18}H_{35}O_2)_2$
Odor:	Bland
Bulk density:	20 lbs. per cu. ft.
Melting point:	147°-149° C.
Moisture:	0.6%
Iodine number:	2 maximum
Solubility:	Insoluble in water, alcohols, esters and ketones. Slightly soluble in hot benzene, toluene, xylene, carbon tetrachloride, vegetable and mineral oils. Soluble in hot pyridine.

For further details, write for Bulletin 42.

Swift

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ment: "We're interested in projects that offer a big opportunity. We don't want projects where we get into competition with a 'pot-and-paddle' operator. Also, we want projects that give us a chance to exercise our technical competence on a big scale."

Like many parts of Hercules, the division owes much of its success to technical service. "Every mill is a potential competitor for rosin size," says Assistant General Manager Carl Eurenius, "So we believe the best technical service job is one where we can teach them how to operate economically—even with less size."

• Tall oil is the second largest in terms of tonnage. With capacity to treat 200 million lbs. of crude tall oil annually, Hercules is the second‡ biggest producer in the U.S. It has no trouble utilizing the rosin, but, along with the rest of the industry, it does have a problem with the fatty acids that are coproduced. This is the big challenge to the division.

"We're trying to upgrade them," Long says. "We're confident we'll be able to duplicate the success that Naval Stores had with rosin. At 5¢/lb. they're the cheapest organic acids in existence."

• Rubber chemicals, the smallest division of Paper Makers, produces Dresinate emulsifiers and hydroperoxide for the rubber industry.

Synthetics Dept: Naval Stores is set up to make and sell rosin derivatives in tank-car quantities. To help find out what a product was good for, the Synthetics Dept. was established in '39. The nucleus of the new department was the purchase of the John L. Lewis Co., which made rosin esters for the paint and varnish industry.

This work remained the mainstay of the department until after World War II. During the war, however, a shortage of tung oil focused attention on PE (pentaerythritol) rosin esters.

Today, PE is one of the department's prime products. A significant portion is consumed captively. Hercules completed a plant in '56 and is operating "substantially at capacity." Says Synthetics' General Manager Sheffield: "We believe in PE, but feel that its greatest potential lies in fields outside of protective coatings."

In '49, the Synthetics Dept. fell upon rather hard times and started looking for products that could be made in the rosin processing equipment. It found the answer in plasticizers. It has stayed in the business because it developed a number of plasticizers based on PE. In fact, only one major Hercules plasticizer isn't made from PE.

The department also has an interest in oil additives, the natural outgrowth of its sales of methyl esters of tall oil and rosins. DMT was the result of a hunt in Europe in the early '50s for new products and processes.

As of now, rosin derivatives are still the biggest profitmakers for the Synthetic Dept. Hercules' expectation, however, is that while rosin derivatives, PE and plasticizers will have normal growth, DMT and other oxidation products will be the fastest growing and eventually will surpass rosin derivatives as money-earners.

Imperial and International: Its latest acquisition, Imperial, is continuing under the direction of Arthur Brown, who had been president of the company before it became part of Hercules. Last year Imperial's sales came to approximately $27.1 million on which it earned $1.9 million.

The primary attraction was Imperial pigments. Its wallpaper line was secondary. "We liked the kind of chemistry they were doing," says Forster, "but we had not had any experience in the wallpaper business." He's intrigued with its possibilities as a growth area, however. His reasoning: interior decorating fashions have alternated between paper and paint. Although the trend is now to paint, it could very well reverse again.

Although the International Dept. is considered operational, until it becomes more firmly established, it is working like one of the auxiliary departments, i.e., the other seven departments contribute to its budget on a *pro-rata* basis.

The Balance Sheet: A critical examination of Hercules can, of course, turn up a number of flaws in its past performance. For instance, in addition to missing the boat in synthetic polymers like styrene and the vinyls, it probably should have entered wood cellulose. With its background in cellulose chemistry and its production of chemical cellulose, it's hard to see how it failed to do so. But as is the case with the plastics, the opportune time is past.

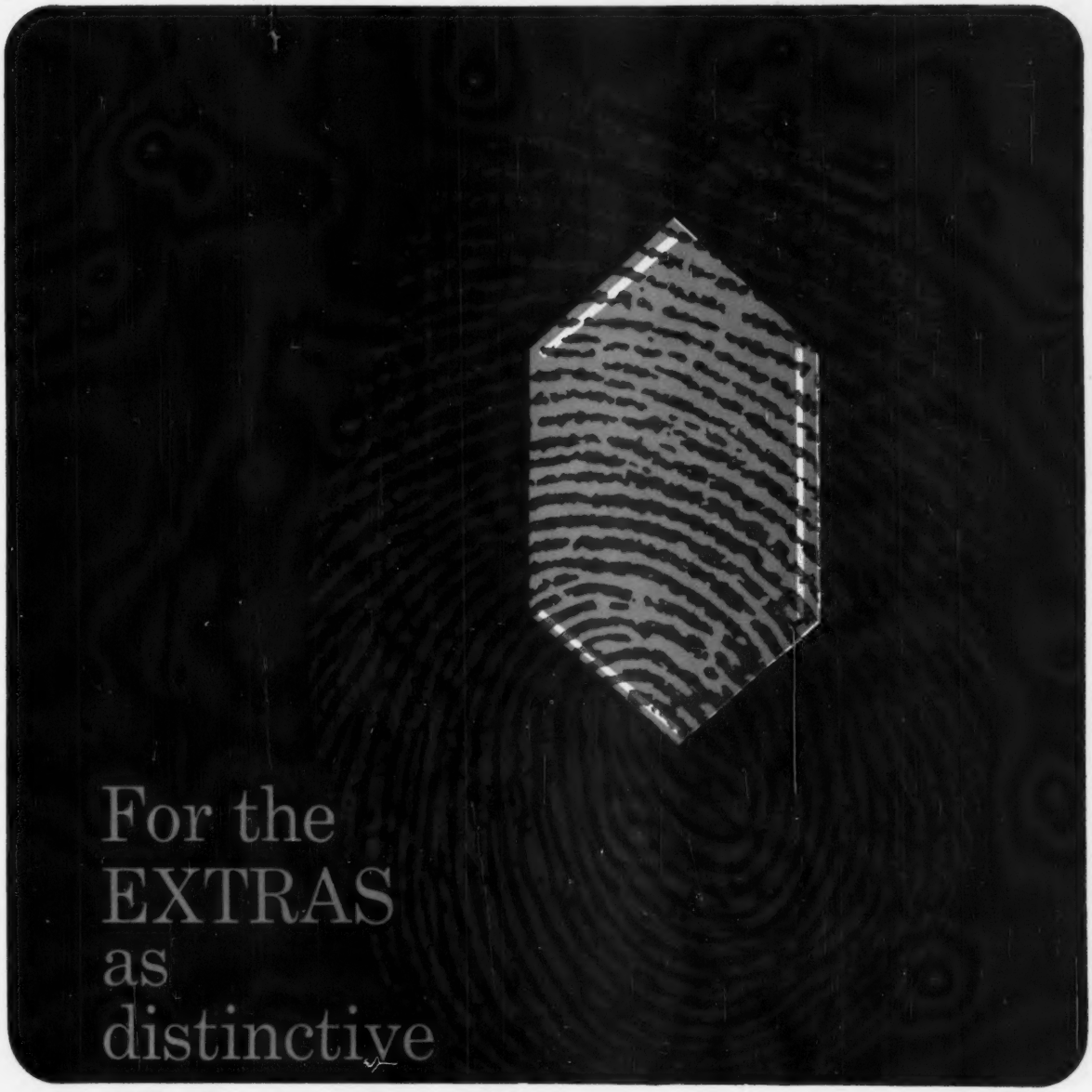
In the first three years of its existence, Hercules had a funded debt. Since then it has shunned borrowing money. Yet President Forster says: "We've never turned a project down for lack of funds. Oh, I suppose we could have grown a lot faster if we had done things differently. But would it have been as sound as the way we've worked it?"

To its credit, Hercules Powder's management has had, through the years, a solid record of accomplishment, both technically and financially. A measure of its success: when the operation was spun off from Du Pont, the ratio of size was approximately 10:1. Despite the fast pace of its big Wilmington neighbor, the ratio has never varied much from that.

Its present course is indicative of a new eagerness to reduce that ratio.

‡ First: Arizona Chemical with 220 million lbs.

Reprints of this report will be available for $1 each. Bulk rates on request.



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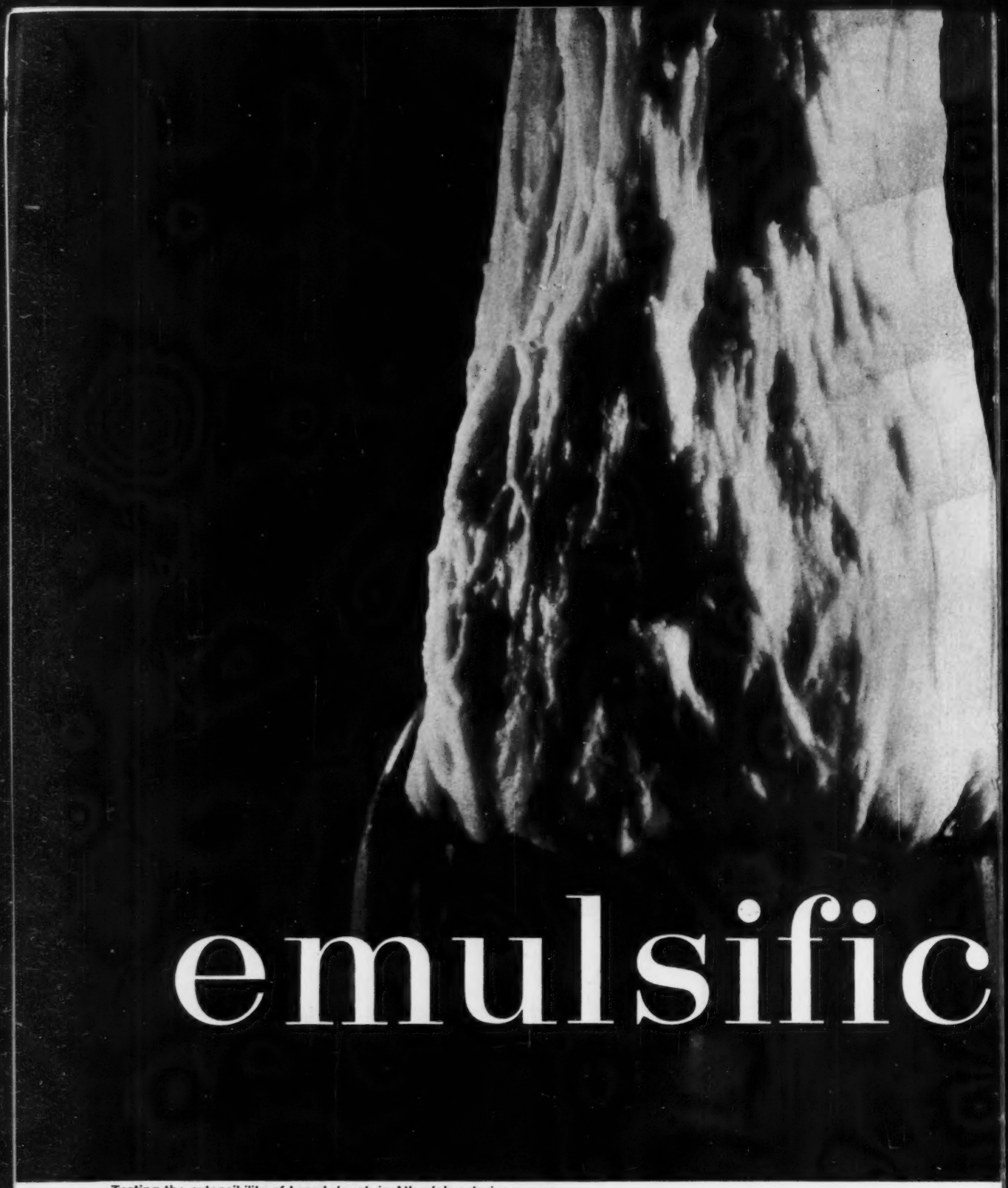

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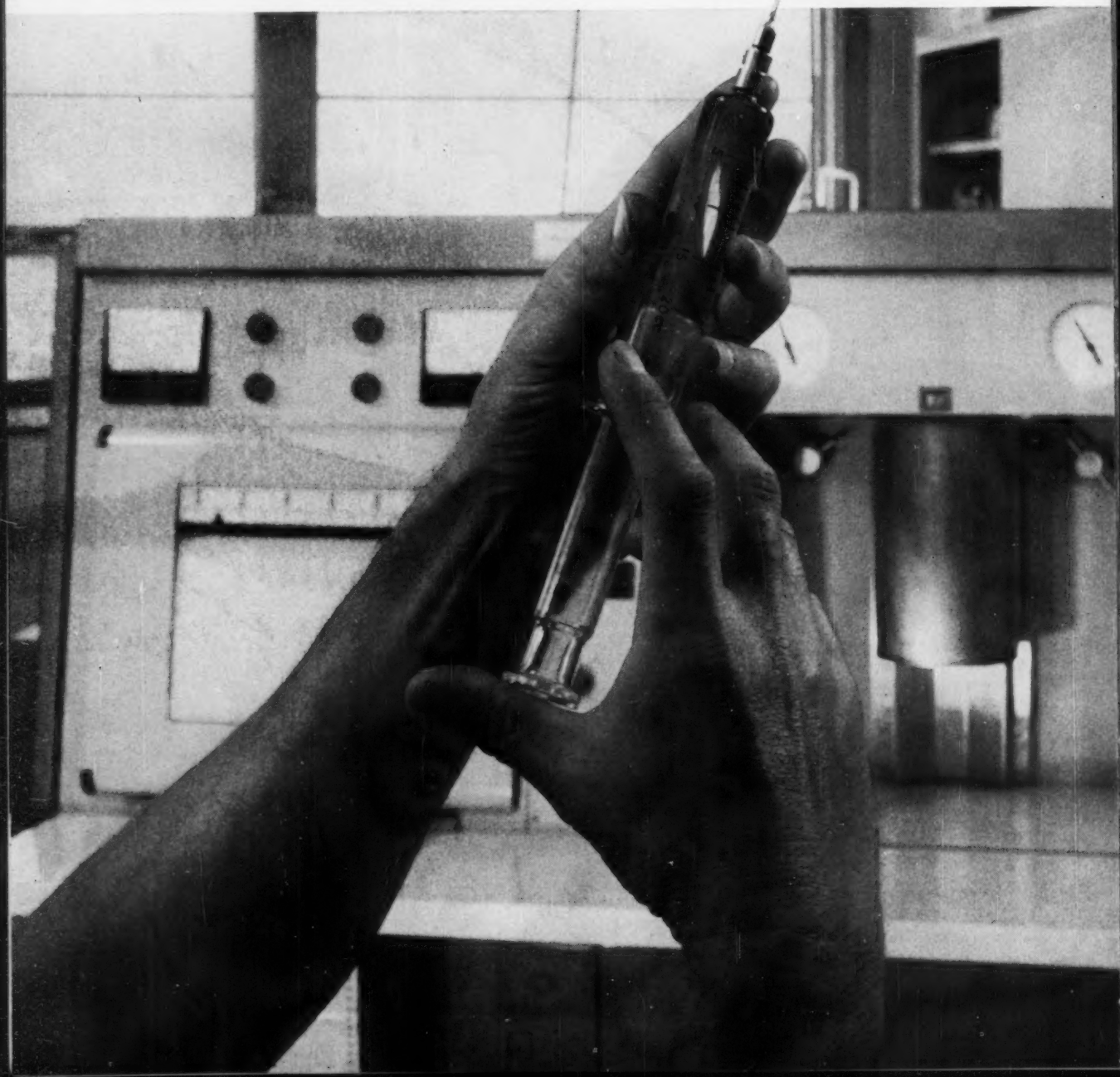
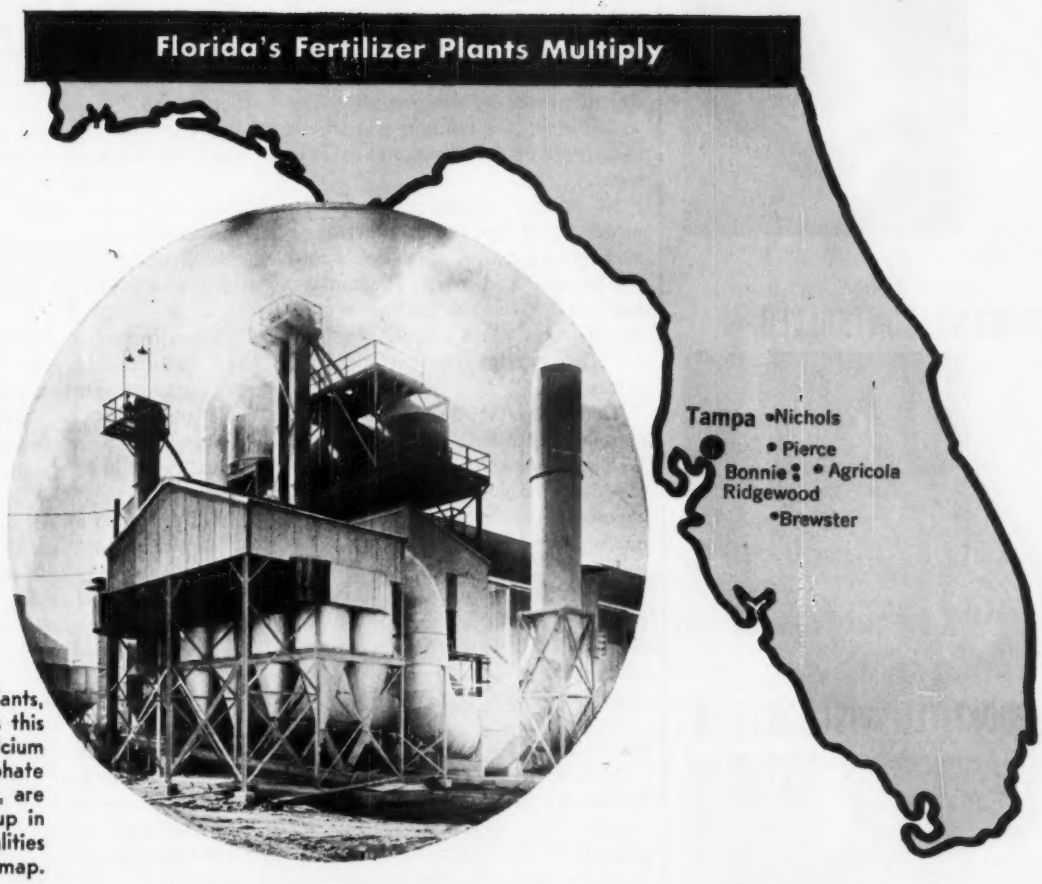




Phosphate plants, such as this calcium phosphate producer, are springing up in the localities shown on map.

Wet Processing Boosts Florida Fertilizers

Last week American Cyanamid disclosed plans for a $10-million expansion, doubling capacity to 400,000 tons/year at its Brewster, Fla., wet-process phosphoric acid plant. This raises the cost of Florida's seven phosphate plants (map) under construction or planned to $35 million, underscores the way newly improved wet processing—and better ways to use "wet" acid—is allowing Florida to bid for the title of world's top producer of phosphate fertilizers.

The new process improvements—wet-processing on a commercial basis is itself only half a dozen years old—center about better control of reaction time; improved filtration equipment; better corrosion resistance. Stemming from these advances: expanded yields of popular and highly concentrated fertilizers, and boosted fertilizer consumption.

Moreover—since it is a prime U.S. source of high - phosphorus - content rock needed for the wet process—Florida is getting most benefit from the improvements. The state is also handy to farm markets, another factor in its favor.

Process Progress: Wet processing is gaining from the over-all U.S. fertilizer boom because it fits into the trend toward more concentrated and tailor-made fertilizer formulas. Diammonium phosphate, in particular, benefited from the success of the TVA wet process (*CW, July 30, p. 46*)—which opened the door to the use of wet process phosphoric acid without a purification step.

Combined consumption of diammonium phosphate and its sister product, triple superphosphate, grew from about 50,000 tons in '46 to about 450,000 tons in '58.

During this 12-year-period, the percentage of diammonium phosphate and triple superphosphate used in fertilizers rose from 2% to 7%.

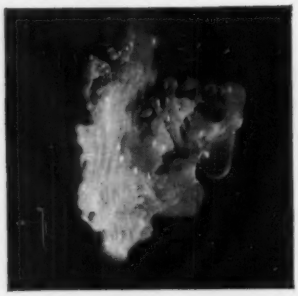
Liquid Assets: Another TVA development replaced furnace phosphoric acid by wet-process acid in making liquid fertilizers (*CW, March 14, '59, p. 60*). Problem with wet-process acid in these fertilizers was formation of equipment-clogging precipitates in the acid upon contact with ammonia.

The TVA improvement involved mixing wet-process phosphoric acid with superphosphoric acid, an acid containing about one and a half times as much phosphorus as normal acid.

Superphosphoric acid keeps the gypsum solids suspended in the wet-process acid, prevents precipitation.

Where Improvements Came: The wet-process phosphoric acid used in these TVA developments has been

YES, NOW VISCOSITY



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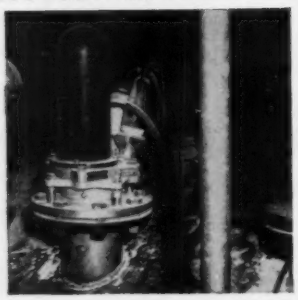
PROCESS CONTROLLED



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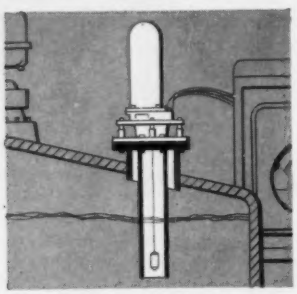

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up-and-coming for the past three to five years. Basically, it's made by reacting phosphate rock with sulfuric acid. It contains less phosphorus and more solid impurities than furnace acid, which is made by smelting phosphate rock, burning the resulting phosphorus and absorbing the phosphoric oxide in water.

As present techniques stand, wet-process acid has several advantages over furnace acid. A prime one is cost: wet-process acid costs $80/ton vs. $88/ton for furnace acid on a comparable basis. On a volume basis, the difference is even greater, since "wet" is less pure.

That's why the TVA diammonium phosphate process is so successful. Wet acid previously required almost-too-costly purification before it could be used in manufacture of diammonium phosphate. Now the TVA process employs an ammoniator, which takes advantage of chemical heat in the acid-ammonia reactions, eliminates the purification step. Another gain: recycle rates and drying requirements are reduced.*

In some ways, the impurities present in wet-process acid, particularly, sulfuric acid and iron and aluminum phosphates turn out to be advantageous; they ease fertilizer mixture granulation. Moreover, impurities such as sulfur, iron, aluminum, zinc, calcium and manganese are present to serve as tracers in production control.

Aside from the lower first cost, wet acid can be cheaper to use: when making a granulated fertilizer with wet-process acid, total raw material cost is lowered—the amounts of triple superphosphate and sulfuric acid needed in a formula are reduced and the quantities of lower-cost, normal superphosphate and anhydrous ammonia are increased. (Triple superphosphate is a fertilizer consisting of 45-50% phosphate.)

The main disadvantage of wet-process acid is its tendency to settle out gypsum fines.

Chances are, however, that wet-acid processing will be further improved, gain more advantages. According to Enrico Pelitti of Chemical Construction Co. (New York), "Although the basic processes for wet-process phosphoric acid are well-known, there is a tremendous advance of know-how that continues to modify the details of the new plants." These advances center about operation of the reaction station, and anticorrosive materials.

Key to success of a wet-process plant lies in the control and operation of the reaction station. Gypsum cake (calcium sulfate) forms when sulfuric acid reacts with phosphate rock.

Close control of the reaction time and sulfuric acid concentration can achieve maximum extraction of available phosphate, an easily filterable, easily washable gypsum, which in turn would result in minimum loss of soluble phosphate (P_2O_5). If the gypsum crystals are too small, they plug up the filter; if too large, the phosphate has not been fully extracted.

Corrosion in wet-process plants rules out equipment generally thought to be corrosion resistant, and that includes materials such as glass-lined steel, the stainless steels, tantalum, high-silicon steels, nickel and nickel-alloys, and copper and copper alloys. The phosphorus and sulfuric acid, along with fluoride and other impurities in the rock, are highly corrosive and scale-forming. Rubber-lined steel pipe and rubber-lined steel storage tanks are required. As rubber has an upper temperature limit of 150 F, acidproof brick is used to line the rubber, permit higher temperatures.

Polyvinyl chloride plastic piping is gaining wider use; research has upped its 250 F temperature limit and diameter range of polyvinyl chloride is increasing beyond the 2-in.-diameter upper limit. Hastalloy C, a high-percentage nickel-chromium alloy, is being used for special applications—for example, the TVA ammoniator.

Florida Location: Fertilizer plants currently produce the formulators' raw materials (phosphoric acid, ammonia, urea, and potash) or, as in many recent cases, special two-component or even one component fertilizers.

Of these, the phosphoric acid plants have been found to be economical when near the source of their most important raw material—phosphate rock. Fertilizers with about 40-60% phosphate are more economical to

* In this process phosphoric acid is partly preneutralized in a tank, then fed to the ammoniator where completion of the ammoniation to diammonium phosphate takes place. Excess ammonia is needed so a scrubber using fresh phosphoric acid absorbs ammonia from the exhaust gases; the resulting ammonia-phosphate solution is recycled to the preneutralizer.

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ship than is phosphate rock. which contains 34% phosphate.

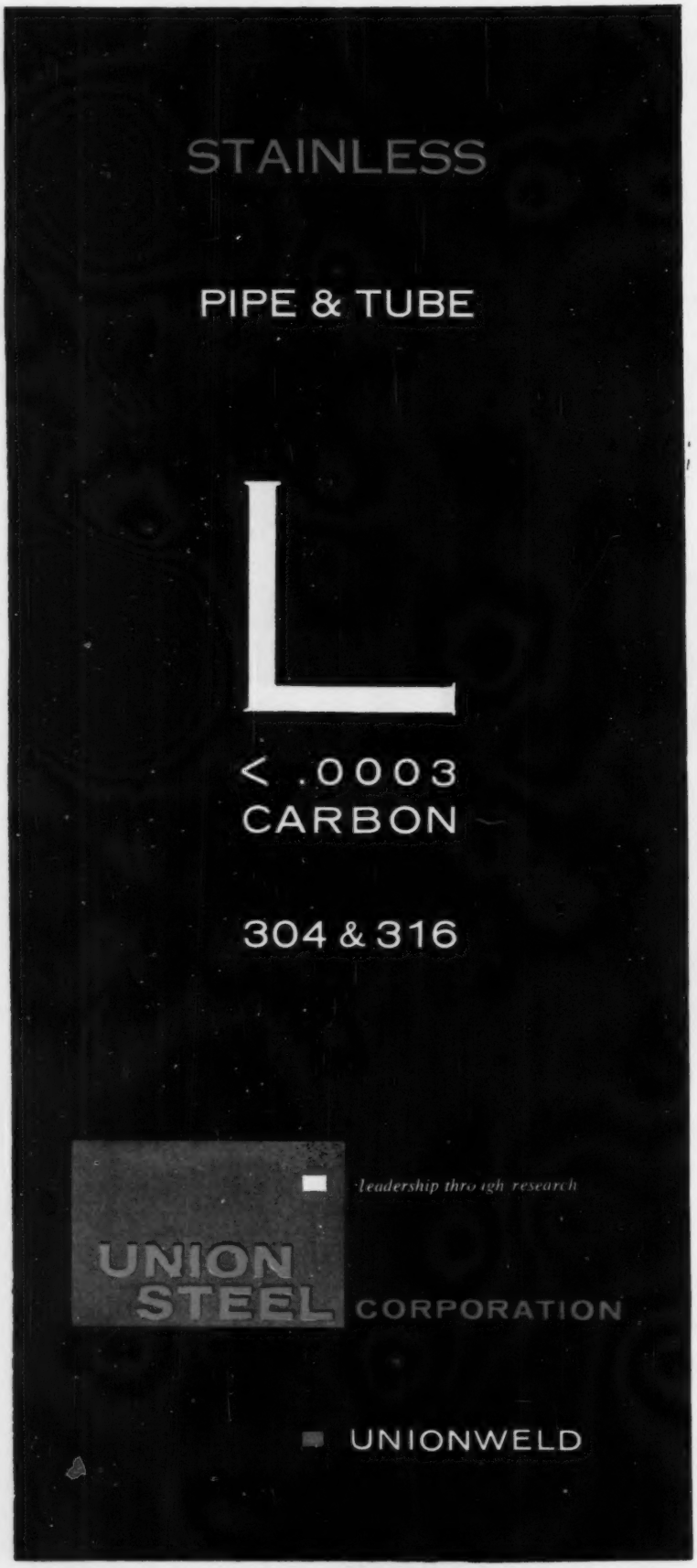
Recently, fertilizer makers have begun to integrate the formulating plants directly with the wet-process phosphoric acid plant. Says B. S. Duff of The Fluor Corp., Ltd. (Los Angeles), "Advantages of the combined operation include: reduced investment costs; reduced recycle in the wet-acid process; and reduced material movement problems, as solids do not have a chance to settle out." Disadvantages: lack of flexibility, distance from consuming farmers.

Florida Forte: In '59, Florida produced 73% of the phosphate rock mined in the U.S. Although the state has only 40% of the U.S. phosphate ore reserves (almost all the other 60% is in Utah and Idaho), Florida ore is preferred, as it is a higher-grade material and can be used for cheaper, wet-process phosphoric acid. The technology for producing wet-process acid from Western rock has not been attempted, and only furnace acid is now feasible.

Although there is no question of the long-term growth in fertilizer usage, a short-term oversupply is evident. Four plants are jumping into diammonium phosphate: Davison Chemical Co. division of W. R. Grace & Co. (Ridgewood, Fla.); Virginia-Carolina Chemical Corp. (Nichols, Fla.), Swift & Co. (Agricola, Fla.) and U.S. Phosphoric Division of the Tennessee Corp. (Tampa, Fla.). Currently, seven plants handle the demand for diammonium phosphate.

Another product that may suffer from temporary oversupply is concentrated superphosphate (about 50% phosphate). A 25% increase in production capacity by early next year will be fostered by Virginia-Carolina and American Cyanamid. Other related action includes large increases in phosphoric acid capacity by Cyanamid and Swift; also, International Minerals & Chemical Corp. (Bonnie, Fla.) and American Agricultural Co. (Pierce, Fla.) are adding facilities.

Phosphate rock reserves in western U.S., Morocco and Brazil are a threat to Florida's supremacy in the phosphate fertilizer business. But Florida has 20 year reserves for the fight, and its plants incorporate valuable know-how. And its the wet-processing experience that's likely to be most significant.



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Dimethylformamide (DMF) and dimethylacetamide (DMAC) are unusually powerful solvents for both organic and inorganic compounds and frequently demonstrate catalytic effects when used as reaction mediums. Many interesting new uses for DMF and DMAC as chemical intermediates are being discovered. Both are available in commercial quantities.

Catalyst and Reaction Solvent

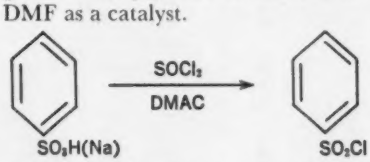
SUBSTITUTION REACTION . . . The catalytic properties of DMF are useful in many substitution reactions, such as in the preparation of phthalic acid derivatives, isocyanates from metal cyanates and organic halides, nitriles from alkyl halides and metal cyanides, and mercaptans using sodium hydrosulfide.

Another example of the use of DMF is in the alkylation of sodium acetylide with n-butyl bromide, where DMF has been found superior to all other solvents tried.

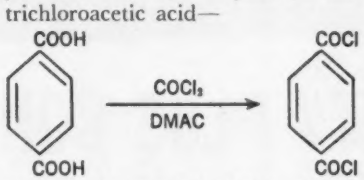
$$CH_3CH_2CH_2CH_2Br + HC{\equiv}CNa \xrightarrow{DMF} CH_3CH_2CH_2CH_2C{\equiv}CH$$

There are many other types of reactions where DMF contributes as a catalyst, such as the Ullman reaction, Gabriel condensations, polymerization, cyclization reactions and sulfonations.

PREPARATION OF ORGANIC ACID CHLORIDES . . . Organic sulfonic acids or their salts can be converted readily to the corresponding acid chloride in excellent yields by treatment with thionyl chloride or phosgene in the presence of DMAC or DMF as a catalyst.



And for converting certain carboxylic acids such as terephthalic and trichloroacetic acid—

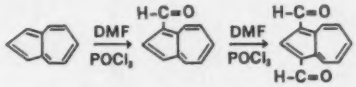


DEHYDROHALOGENATION... Many dehydrohalogenations are carried out smoothly using DMF or DMAC as a catalyst and solvent. For example, dehydrochlorination of 2-chloro-2-methylcyclohexanone to 2-methyl-2-cyclohexenone is easily carried out with DMF and LiCl.

An interesting example of DMF's utility is the selective dehydrobromination of 3-β-acetoxy-5-α-chloro-20-bromobisnorcholan-22-al with DMF despite the relative ease of dehydrochlorination.

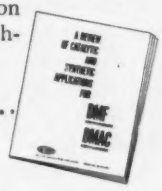
Applications in Organic Synthesis

The $POCl_3$-DMF complex is a low-cost formylating agent. An interesting example is the introduction of one or two aldehyde groups into cyclic organic molecules with DMF and $POCl_3$ or $COCl_2$.



New Chemistry Covered in Revised Booklet

Revised, up-to-date booklet is a compilation of the most important catalytic effects and synthetic applications of DMF and DMAC from over 180 sources. It details the use of these amides in: catalytic, synthetic, solvolytic, and analytical applications. Reference and patent coverage are detailed. Mail coupon for this valuable technical review.



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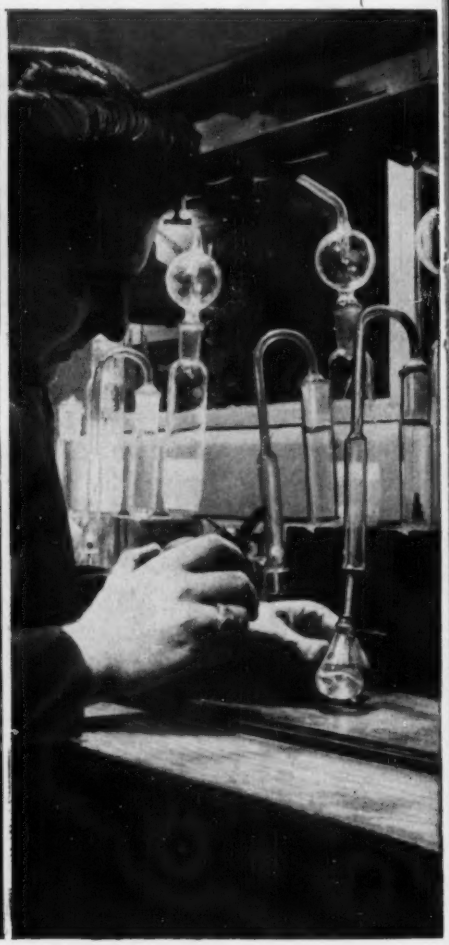

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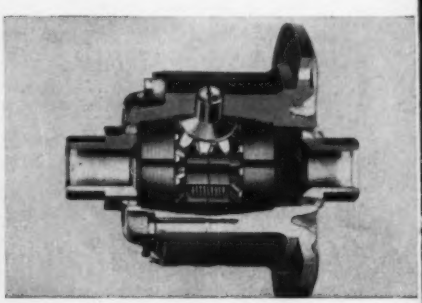
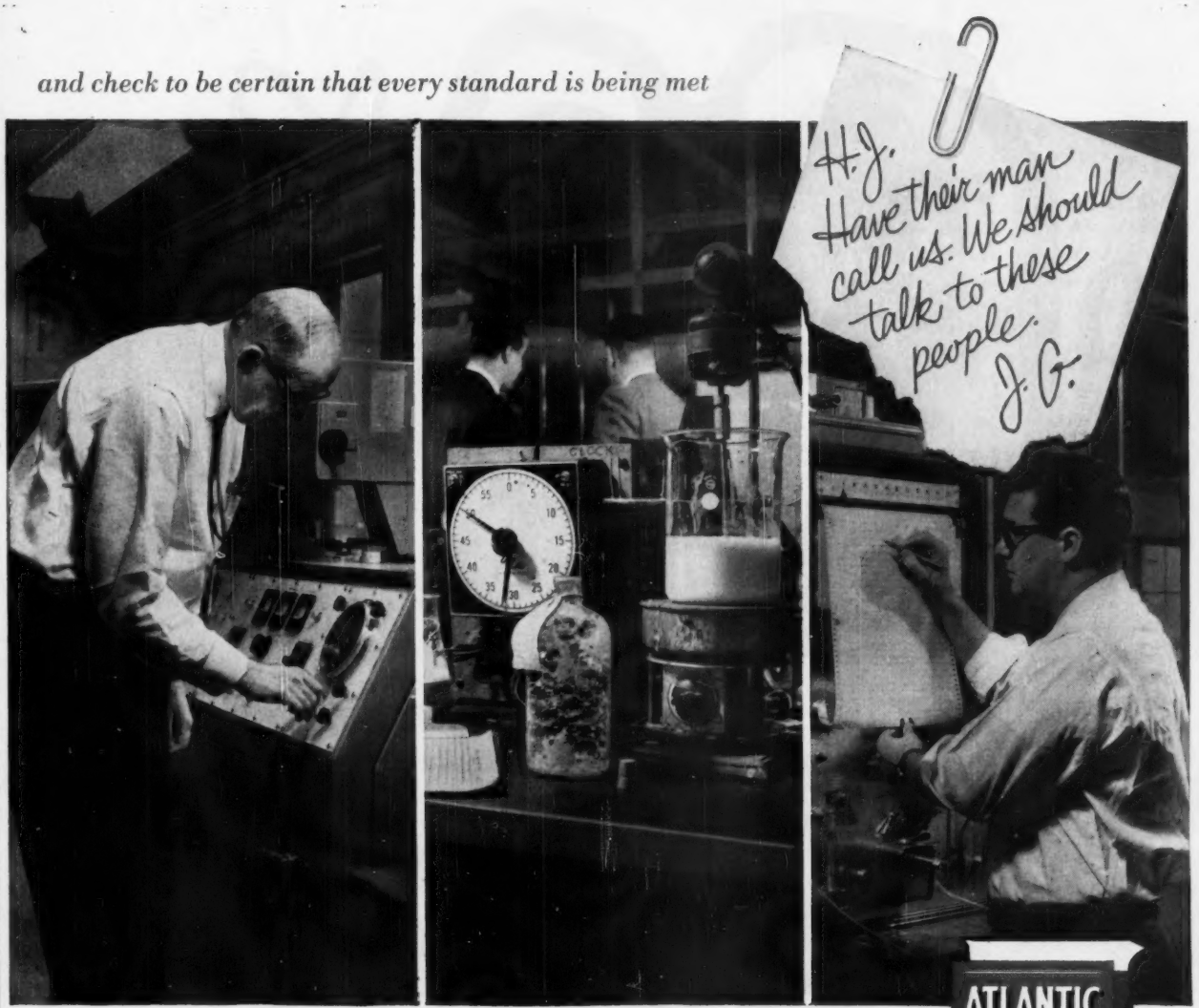


TECHNICAL EICOSANE This hydrocarbon with the formula $C_{20}H_{42}$ is a paraffin containing essentially 20 carbon atoms. Has a low melting point (96.5° F). Its molecular structure enables it to chlorinate readily, producing compounds of unusual stability having low viscosities with high chlorine content. Typical uses among many applications are: flameproofing compounds, chemical intermediate for gear lubricants and plasticizers.

and check to be certain that every standard is being met



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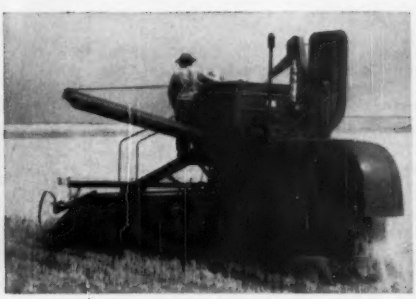

ANHYDROUS AMMONIA This chemical raw material has a wide variety of uses for quality products. To mention a few of the applications: a valuable plant nutrient either applied directly to soil or used to manufacture fertilizers; to produce explosives and to make oxidizing agents essential in the chemical synthesis of plastics; as a source of hydrogen for the bright-annealing of stainless steels and a nitrogen source for nitriding alloy steels.

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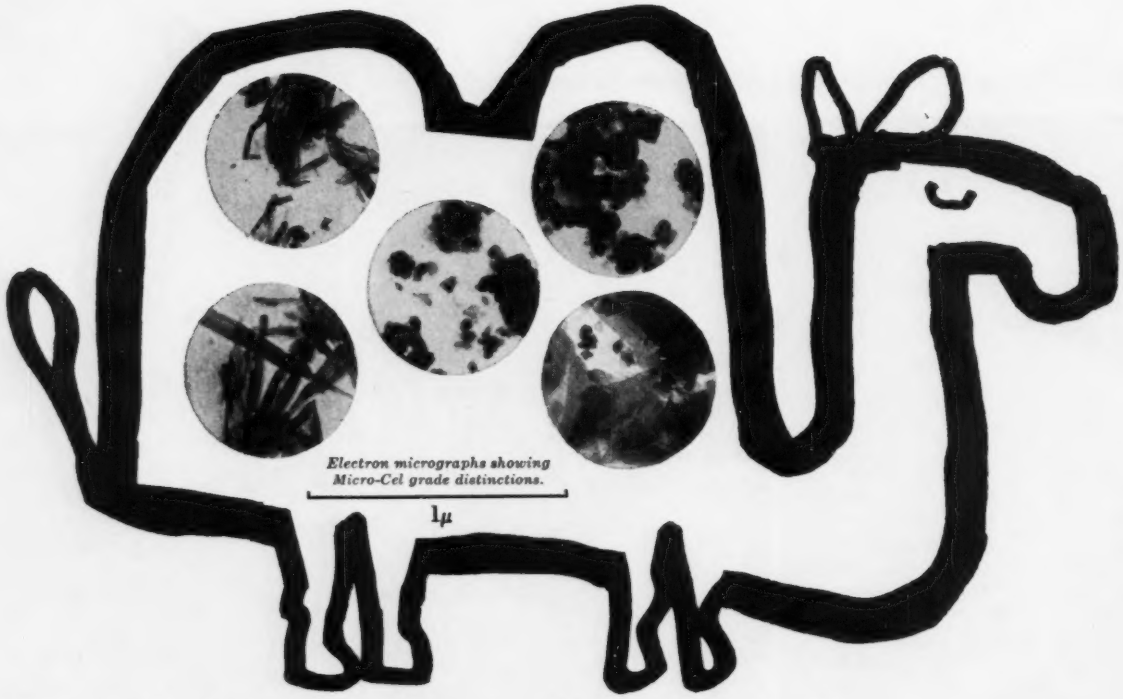

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CW PHOTO—CLYDE HARE

Hagan President Hopwood answers questions during informal break.

Training 'Company' Men

Next week in Pittsburgh, Pa., the four young cadet engineers grouped around their company president (*above*) — and 28 fellow cadets — will swing into the last phase of a unique training program at Hagan Chemicals & Controls, Inc. It's designed to meet a problem that, training experts say, is plaguing many medium-size, diversified companies: how to effectively train middle-management employees broadly enough so that in day-to-day jobs they don't become unresponsive to company-wide goals.

Hagan's answer is a "cadet engineer" program that:

- Catches employees at the start of their employment before they become too specialized in their business outlook.
- Fosters a broad company outlook.
- Expects no returns from employees while they're being trained.
- Sends employees to permanent assignments with a strong sense of their places in the over-all Hagan picture.
- Builds loyalty from the start.

Training leaders elsewhere in the chemical industry agree it's easy to train people within limited spheres of activity. But they say new approches —such as Hagan's—are needed to give a sense of corporate identity and usefulness, train employees so that they can move into practically any beginning assignment in the company. "Cadet engineers," by the way, is now somewhat of a misnomer, the company says, since a number of non-engineering employees take all or part of the course. Nevertheless, the term persists.

Hagan—with 1,100 employees, $40 million in annual sales—operates in three major areas. It makes chemicals and equipment for all phases of industrial and municipal water treatment; instruments and controls for heavy industry; and consumer water-treating and water-softening chemicals and equipment. Because of its diversified activities, training had been handled in an informal, uncoordinated way. Each new employee had a one-sided picture of the company, was molded to fit into a particular slot. Each division, lab and group had its own training methods, with haphazard results.

Price and Payoff: Since its inception two years ago, Hagan has poured time, effort and money into its cadet program, has turned out engineers, salesmen, service and research men who are "worth more to us now at the end of a year than most men were after two years, before the program," according to Hagan President W. W. Hopwood.

Personnel Director Ross Cibella, shepherd of the cadet flock, adds, "We don't expect anything from them for their first six months, except concentrated study. You can't combine real training and work and expect good results from either."

Combining the Effort: Hagan piloted its cadet program last year with 20 engineers and chemists. Benefiting from this first program, the company now has a solid, three-part training schedule, tailored to fit the individual, the company and the division.

When a man is first hired, usually right out of college, he is assigned to the field in his home area until formal courses begin at Pittsburgh. During this first period, he travels with a field engineer, seeing his life and environment, and company methods and equipment. He meets customers and receives informal instruction from the field man.

A formal, two months' course begins in midsummer, and the cadet (and his family) moves to Pittsburgh for a series of daily lectures, lab periods, field trips, plant tours, and weekly quizzes. He may also do routine company work or conduct a spe-

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cific project—such as some research problem.

During the stint at Pittsburgh about two weeks is spent in general class sessions, to orient cadets on the company as a whole — on its policies, methods and history, and on subjects of general interest, including such diverse matters as how to develop customer acceptance, how to write good letters. Otherwise, classes are divided according to the divisions in which cadets will ultimately work.

A cadet's training is sufficiently diversified—both technically and nontechnically—that he may conceivably be assigned to any work in the division. The majority of cadets go into service or sales, but by the time anyone is placed, his aptitude, interest and ability have been demonstrated and placement can be made with a higher degree of certainty.

The third phase of the program is usually in the field, where the cadet works for several months with the man he will probably assist or replace. He may, however, remain in Pittsburgh for further instruction, as the company's need or the man's competence dictates.

Company officials believe that this training and the highly individual approach to each student has resulted in better-placed and better-adjusted employees.

Individual Emphasis: Individuality is the key to handling the cadets, says Cibella, particularly in running the program.

While the man is in the field initially, the engineer to whom he's assigned acts as his personal advisor.

When the cadet is in Pittsburgh one of the company's senior engineers or scientists is assigned to him as his guide and advisor.

The advisor is "almost a father confessor," as Cibella sees it.

In Class: Classroom training is run by division coordinators. Classes are small enough to keep close tabs on each cadet. When the man finally has his on-the-job training in the field —the program's third phase—the man with whom he works guides his development and acts as a supervisor, giving him greater responsibility, as growth warrants. Reports from the advisors and cadets are sent back to headquarters and used as the basis for evaluating the cadet and changing the program.

"The program and curricula are kept flexible, and they keep changing," Cibella says. "We haven't reached the best system yet, probably never will, but we see greater improvement every year." Each year Hagan has added more money to the training budget. The entire cadet program, including cadets' salaries, is budgeted as a corporate expense—general overhead. To put 10 men through the Pittsburgh phase of the program, says Hagan, costs in the neighborhood of $25-30,000—including cadets' salaries.

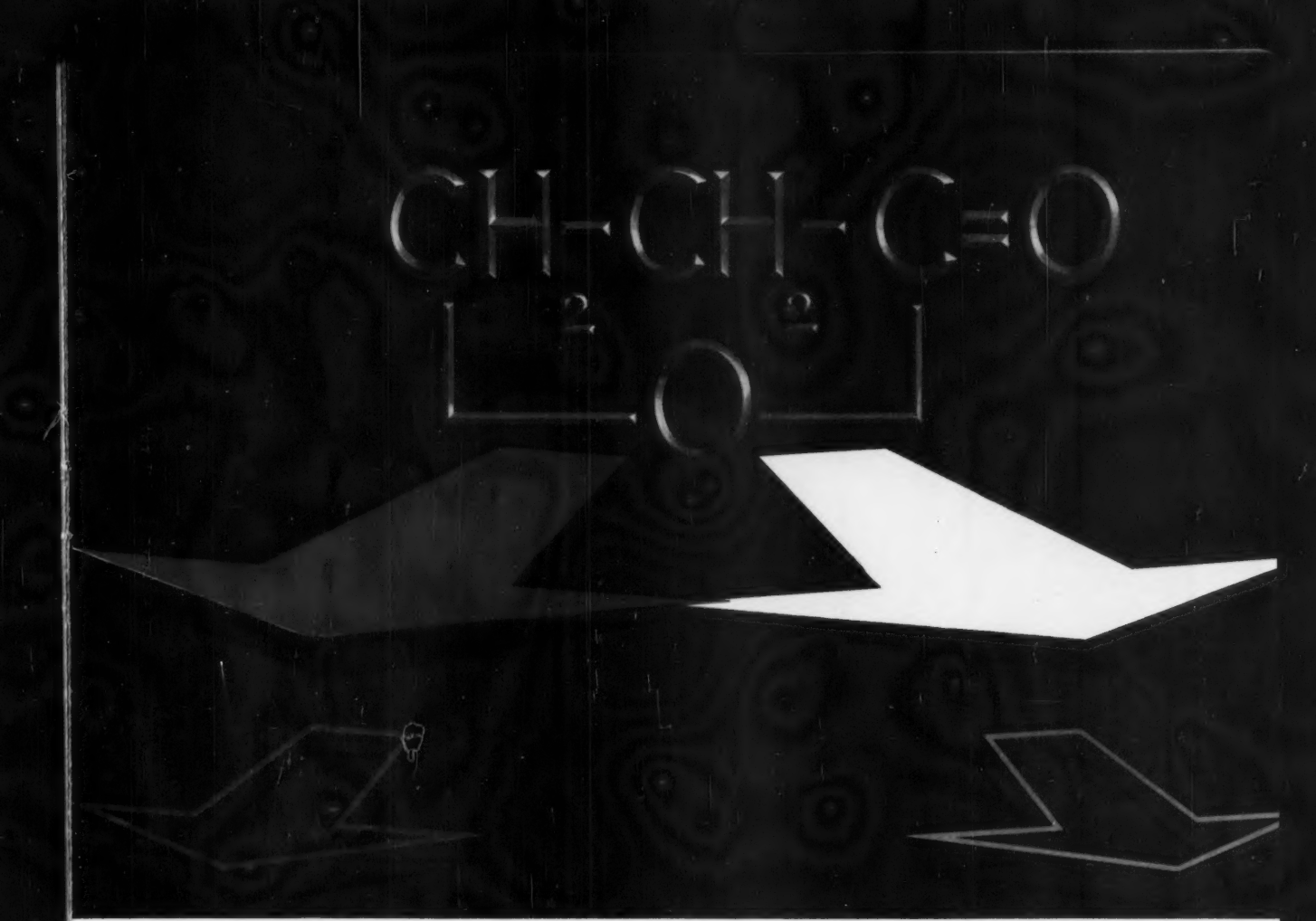
The value of such a program can't be measured in monetary terms alone. One executive puts it this way: "Each man is doing more. Business volume has grown faster than the number of employees. This is at least partly due to better training."

Hopwood himself says that Hagan could not be without the program now. "No matter how well prepared a man is, when he comes to us, what he has to learn about Hagan isn't in the texts. With so much complex material, this program is an absolute necessity. We're not turning out finished products but men who are ready to be Hagan employees."

Whence Came the Gas?

At La Porte, Tex., last week Nelson Lewis, manager of Delmar Chemical's S&W Division phosgene plant, experienced a situation most managers have nightmares about, few ever come face-to-face with, many would like to know how to plan against. In the short period of a few hours La Porte citizens began to retch; five became unconscious and many complained of headaches. And Lewis's nearby plant was being blamed for gassing the city.

Lewis first heard about the trouble from the local gas company, was later deluged with questions by local radio and newspaper reporters. Shortly afterward calls came in from state police and health officials. By that time he was convinced that his phosgene plant was not the source—partly because a "thorough check of operations" indicated everything in the plant was working smoothly, partly because the reported effects (retching, headaches, unconsciousness) weren't the usual reactions to phosgene. As one man put it, "Phosgene irritates your lungs, makes you



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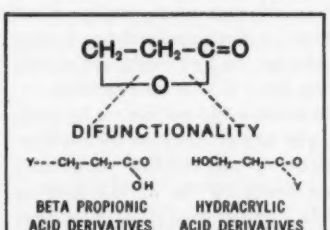

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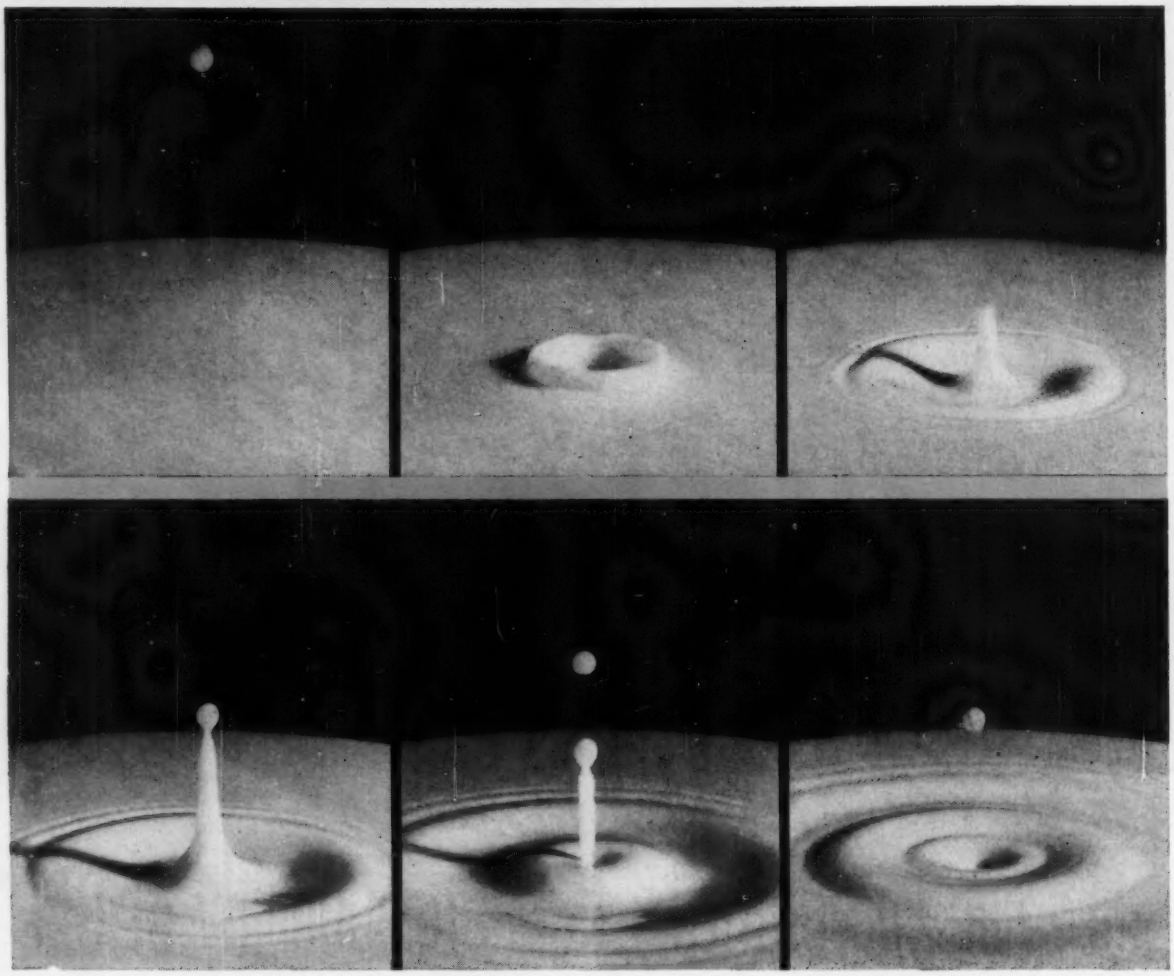

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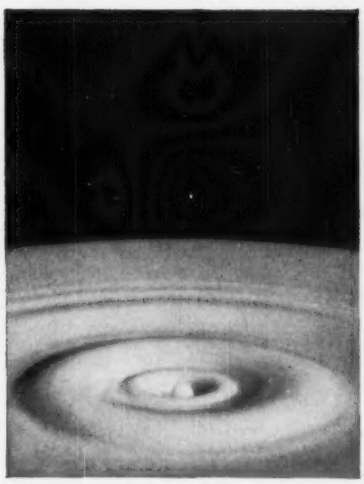

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cough, causes your lungs to fill with liquid." Besides, said others, the odor wasn't the "green corn" smell of phosgene.

First thing Lewis did after hearing the news and checking out his own operations was to put through a phone call to company management in Elkton, Md. In a six-or-seven-way phone conference among Texas and Maryland management and company lawyers, management decided it should make no comments until more facts were known.

Elkton management soon was besieged with questions from newsmen, friends and others. Customers called to ask whether the plant was to be shut down. Until late that evening management stood by the phones to give it's answer: "We're satisfied that operations are normal and routine; the plant hasn't and won't shut down."

Clearing the Air: After a quick trip into La Porte to learn more, Lewis decided to be as open as circumstances permitted. He invited local health and police officials into the plant to see records and data charts. Using these he was able to make a case that the plant was not at fault, told both officials and local newsmen of his position.

As a result one state official expressed belief that S&W's operations weren't the source of the gas. At the same time Du Pont's agricultural chemical plant northwest of La Porte, which uses phosgene, said it's operations were normal, weren't leaking gas.

Nevertheless, nationally distributed news reports persisted that the gas was phosgene, was leaking from the plant, and that the plant was shut down. Lewis issued denials that the plant was shut down—another indication, he pointed out, that operations were normal.

The gas blew away in 30 minutes. So far no one has reported any aftereffects. And late last week a court of inquiring was scheduled to begin seeking the cause of the problem. S&W welcomed the inquiry, thinks it may prove the gas was not phosgene. Other possible sources cited by local observers: chlorine leakage from the city sewer following a tank-cleaning operation several days earlier; sulfurated gases escaping from underground deposits opened by heavy rains in the area.

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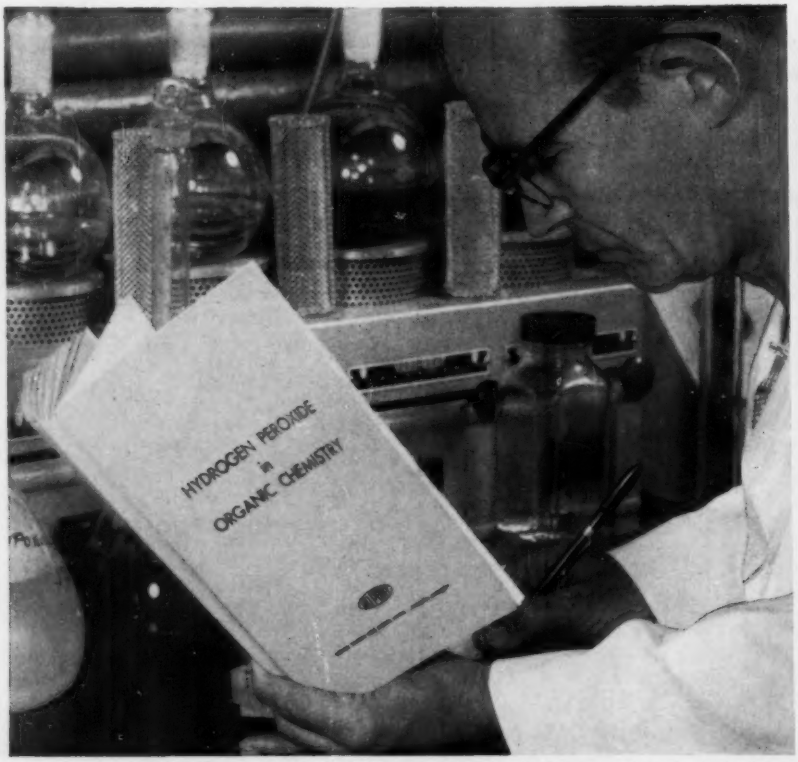

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Bounce Back: At Kaufman Rubber Co.'s Kitchener, Ont., plant nearly half the 700 striking employees represented by United Rubber Workers have returned to work after the company advertised that it had jobs open. The union had been on strike since late June over wages and demands for a union shop. The company claims it is hiring people "as fast as we can handle them."

•

Soap Pay: Procter & Gamble's Sacramento, Calif., plant and the Independent Soap Workers Union have agreed on a two-year contract, expiring Aug. 19, '62, covering 300 employees. The pact calls for an average 12¢/hour wage increase each year, with an additional 9¢/hour in fringe benefits. Other provisions: company-paid hospitalization for employees and their families, additional pay differential for midnight shift workers.

KEY CHANGES

John E. Minch, Sr., to president, Howard Paper Mills, Inc., subsidiary of St. Regis Paper Co. (New York).

Robert A. Jolley, Jr., to board of directors, Vita-Lab, Inc. (Greenville, S.C.).

Curtis A. Cox to vice-president, Virginia-Carolina Chemical Corp. (Richmond, Va.).

William A. Thorne to vice-president and board of directors, Tar Distilling Co., Inc., and Old Colony Tar Co., Inc., wholly owned subsidiaries of Witco Chemical Co., Inc. (New York).

Frank W. Conkling to president, Airkem, Inc. (New York).

Earl McCluer to vice-president and general manager, Northwest operations, McGuire Chemical Co. (Oakland, Calif.).

John W. Iliff to vice-president, foreign operations, The Harshaw Chemical Co. (Cleveland).

Clifton C. Candee to vice-president, Holland Color and Chemical Co., subsidiary of Chemetron Corp. (Chicago).

Richard L. Seigel to vice-president, marketing, industrial products, The Hudson Pulp and Paper Corp. (New York).

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CHEMICAL WEEK
August 27, 1960

A new process for bonding glass to inexpensive steel offers economies and a broader choice of glass compositions in making glass-lined chemical reaction vessels, storage tanks, etc. The method, developed (and now in use) by A. O. Smith Corp. (Milwaukee), skips use of a "ground coat" of glass, substitutes a coating of nickelous oxide, silica, and barium metaphosphate. Over this layer, glass slurry is sprayed and fired in the conventional manner. According to research supervisor James Sullivan, inventor of the process, corrosion resistance of the glass coating is enhanced by the process, which also permits use of 0.08-0.2% carbon steel, instead of the usual, higher cost 0.02-0.3% carbon "enameling iron."

Research on improved glass or porcelain steel-coating processes is also under way at Ferro Corp. (Cleveland), which anticipates growth possibilities in porcelain enamel in home construction; Chas. Pfizer (Brooklyn, N. Y.), developer of a citric acid process for improving adhesion of porcelain to steel; and General Electric, among others.

•

A new polypropylene process using a catalyzed reaction with an electric spark as initiator is claimed by Tokuyama Soda (Yamaguchi Prefecture, Japan). The reportedly "somewhat different" catalyst contains a special metal halide, a metallic deoxidizing agent, and an alkyl halide.

In the process, gaseous propylene and propane in a seven-to-three ratio are mixed and passed between the electrode, while a high voltage is applied to produce a continuous arc. The result is a yellowish green product, which is washed and dehydrated to obtain a white sediment containing polypropylene having an average molecular weight of 500,000 and a melting point of about 330 F. The yields—which are an important consideration for economic production—were not disclosed. But Tokuyama intends to commercialize its process, says it's confident it can "get better yields than conventional" processes can.

•

Lithium nitrate is the key to a new technique for pinpointing concentration of metals in wastes. The lithium nitrate is added to a sample of waste and the mixture is evaporated. When the resulting salts are burned electrically in a spectograph, each metal gives off a characteristic light, which is recorded on film for quantitative and qualitative determinations. Applicable to industrial wastes, this technique, developed by General Motors, can help chemical processors prevent harmful solutions from finding their way into city sewage systems.

•

Wool fibers get their second assist from chemical treatments in a little over a month. Dow Chemical has come out with two film-forming resins good for improving the properties of wool as well as other pro-

teinaceous and cellulosic materials such as cotton, paper and leather. (The U.S. Dept. of Agriculture's process for treating wool slacks and wool felt is reported in *CW Technology Newsletter, July 23.*)

Dow's resins, trademarked Devlex 130 and Devlex A515, are polymers of N-vinyl-5-methyl-2-oxazolidine and copolymers of this material with vinyl acetate. Both are available as white, free-flowing powders. Devlex 130 melts at 250 C and Devlex A515 at 125-135.

The Devlex resins, whose solubilities are suggestive of the albumin group of proteins, are said to be suitable for use in clarifying beer, wine and other liquors, and in tablet binding and hair-grooming preparations.

•

Progress in plastics for medical and dental uses (*CW, March 1, '58, p. 26*) is underscored by new reports from Minnesota Mining and Manufacturing Co. (St. Paul), Dow Corning Corp. (Midland, Mich.) and Chemical Marketing & Research Co. (New York).

Discs made of 3M's molded Kel-F halofluorocarbon have been found suitable as blood filters in cardiac surgery at Jewish Hospital (Brooklyn, N.Y.). Surgical facial reconstruction is being expedited by use of silicone rubber, according to R. R. McGregor, director of the Dow Corning Center for Aid to Medical Research. And a new market study (price: $75) by CM&R details the rising opportunities for plastics in medicine (e.g., urethanes in bone repair). Sample finding: sales of nonabsorbable, synthetic surgical sutures will approach $10 million this year.

•

Another new one-step propylene-to-acrylonitrile process is described in Australian patent application 56, 564/60, registered by Distillers Co., Ltd. (Edinburgh, Scotland). Unlike Sohio Chemical, which describes a bismuth phosphomolybdate catalyst in Belgian patent application 571,200 (*CW Technology Newsletter, May 30, '59*), Distillers has a catalyst comprising "a mixture of the oxides of molybdenum and cobalt and/or a compound of molybdenum, cobalt and oxygen." Distillers has previously described the use of molybdic oxide to make acrylonitrile from acrolein, which can be made from propylene. But Sohio's process had been the only reported one-step route.

•

A new tranquilizer chemically related to meprobamate (e.g., Miltown) but requiring only half the dosage has been developed by Merck and is being marketed by Merck Sharp & Dohme Division (West Point, Pa.). Called Striatran, it is 1-ethyl-methylpropyl carbamate, and is said to cause little or no drowsiness, a frequent side-effect of meprobamate.

Another tranquilizer, reserpine (Ciba's Serpasil), appears to increase the antitumor effect of anticancer drug 4-aminopteroylglutamic acid (Lederle's Aminopterin) in fruit flies, according to histologist E. D. Goldsmith at New York University. The finding may have value in human cancer research.

CALLERY BYLINE

News and views on the application of Boron chemicals to better end-products

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Triethylborane is spontaneously flammable in air, but does not react with water. Density at 25° C is 0.68. Melting point is –92.5° C. Boiling point is 95° C. Heat of combustion is 20,000 Btu/lb. It is miscible with hydrocarbons, so it can be used as an additive to conventional fuels.

TEB has much wider flammability limits than hydrocarbons. Thus TEB permits higher altitude flights and simpler engines.

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*Samples not available; write Manager, Defense Product Sales regarding price schedules and information.

Other members of the above series can be prepared by special arrangement. We'd be happy to fulfill your requirements.

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New transesterification catalyst and color improver for polyester polymerizations

A new industrial use for Amine-Boranes has been uncovered by Callery Application Research. We've found that Amine-Boranes are effective transesterification catalysts and color improvers for the polymerization of polyesters.

The synthesis of certain reactants necessary for polyester manufacture requires catalytic oxidation. Trace quantities of oxidation catalyst possibly contribute to color formation of the polyester end product. Amine-Boranes significantly reduce the tendency of these trace oxidants to form color bodies—thus improving the final end product color.

Perhaps Callery Amine-Boranes may be useful as a (1) catalyst, (2) color improver, (3) both catalyst and color improver in your particular polyester process. We would be pleased to provide evaluation samples.

Some typical catalyst combinations, reaction times, and polymer properties are tabulated below using Dimethyl Terephthalate and Ethylene Glycol.

Catalyst		Reaction Time	Polymer Properties	
wt % based on terephthalate	Type	Hrs., Min.	MP °C	Color
.03 .70	Na Mg	6:00	243-252	Yellow Brown
.03 .70 1	Na Mg TMAB*	3:17	225-234	Light Yellow
.03	Na	11:12	228-234	Tan
.03 1	Na TMAB*	6:20	192-198	Off White
.70	Mg	5:06	223-237	Off White
.70 1	Mg TMAB*	2:54	235-242	Light Tan
.01 .50	Mg TMAB*	3:16	242-249	Off White
1	MgAc	3:20	233-242	Yellow Brown
1	TMAB*	4:52	200-220	White

*Refers to Trimethylamine-Borane

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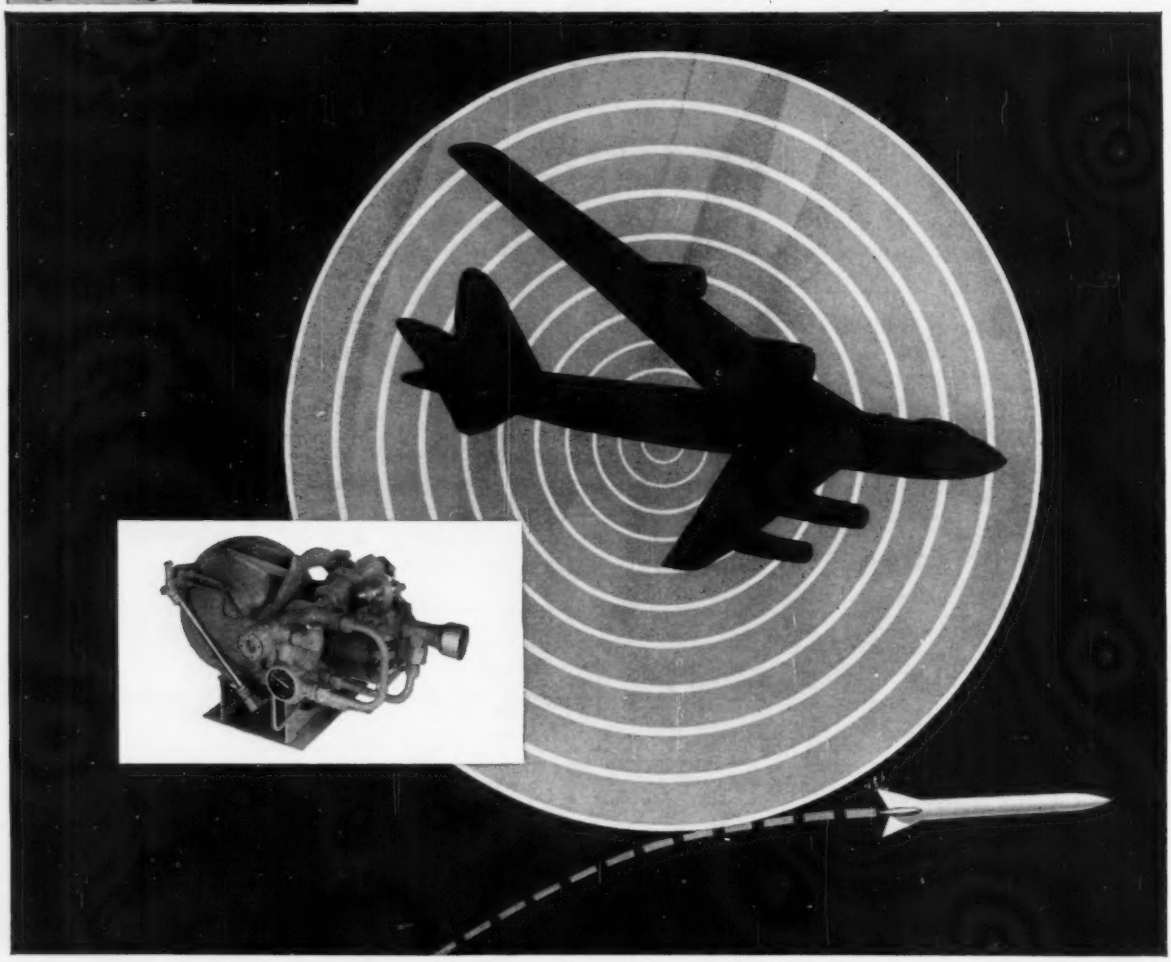

HOW TO HOLD A JAM SESSION 8 MILES UP

Vickers active cooling system (inset) uses FC-75 in countermeasures system

The increasing sophistication of electronic countermeasures systems poses many problems. Among them—how to cool vital components at the environmental and operational extremes encountered in sonic and supersonic aircraft.

For the Sperry countermeasures system, a new airborne active cooling system—capable of dissipating 47KW in a 74-lb. package—was developed by Vickers using 3M Dielectric Coolant FC-75.

This most stable of all fluids offered to electronics has high electric strength of 37KV. It is self-healing, and maintains electric strength after repeated high voltage arcing. It pours at —148°F and boils at 212°F at one atmosphere . . . ideally suited for evaporative cooling.

Compatible with most materials, FC-75 is non-corrosive, non-flammable, non-toxic, non-explosive and odorless. It is thermally stable in excess of 800°F, and will not form sludges or gums under extremely rigorous conditions. These properties make it ideal as a coolant.

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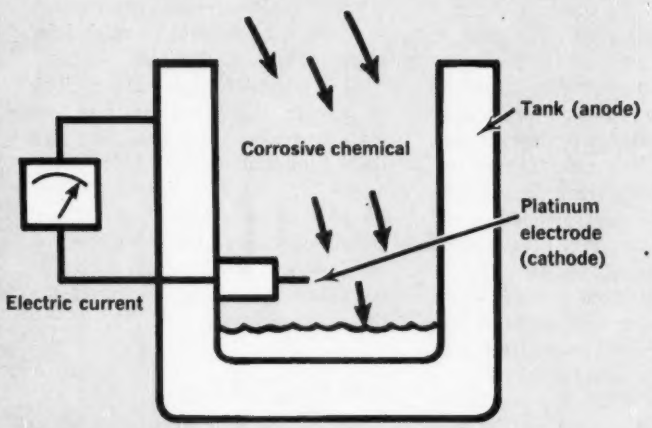
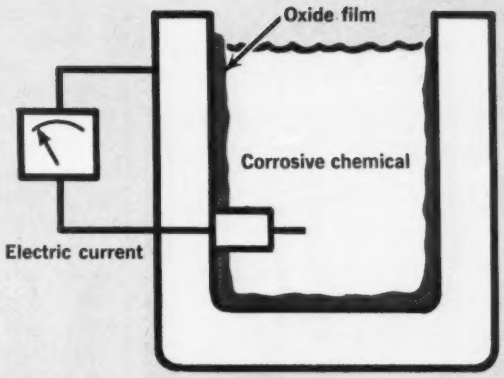
How anodic protection works



1. As corrosive chemical is added to tank, electric current is impressed between tank and electrode.



2. In seconds, protective oxide film forms on tank walls; current drops, maintains film.

Anodic Corrosion Control Goes Commercial

With last week's licensing of Minneapolis-Honeywell Regulator Co. to manufacture and sell Continental Oil Co.'s Anotrol system (CW Technology Newsletter, Aug. 20), chemical companies for the first time will be able to purchase equipment for anodic protection against corrosion (see diagram above). The system has already been hailed as a major development achievement by corrosion engineers, but indications are that its commercial success may not be so easily won.

Theoretically, the anodic protection system has tantalizing advantages. Product quality can be improved, equipment repairs cut and less expensive construction materials used. For example, during a one-year test of the system, Conoco protected a 400-sq.ft. neutralizer tank of 304 stainless steel from attack by 67% sulfuric acid for less than a penny a day.* The iron content of the product was reduced from 270 ppm. to 20 ppm. and seven-times-per-month tank repairs were eliminated.

As long as they confine their comments to Conoco's development work, corrosion engineers at most chemical companies talk with enthusiasm. But enthusiasm changes to more than mere caution when they discuss anodic's commerical possibilities. Reasons for the shift in enthusiasm are many and complex, but most of them are tied directly to the anodic protection theory.

Corrosion Fights Corrosion: Unlike cathodic protection, which counterbalances corrosion with an impressed electric current, anodic protection uses an impressed current to actually cause a type of corrosion†—an oxide film. This film on the metal protects it from attack by corrosive chemicals. The oxide can be formed quickly (in less than one minute); after this is done, the current must be dropped and maintained at a low level to keep the film on the metal yet prevent damaging corrosion.

Until Conoco developed its patent-applied-for system, no one had been able to come up with the precise current controls needed. Anodic protection worked well as a laboratory technique, but until the controls were worked out, it was not a commercially useful corrosion fighter. Many corrosion engineers still feel that the technique will have very limited commercial value because—they claim—many systems can't be controlled.

For example, solutions must be good conductors (in practicality, contain water). Many plants producing organics won't be able to use the system. And it can't be used in reducing environments or in solutions containing appreciable amounts of halogens. However, for acids such as sulfuric, phosphoric and nitric, and for sodium and potassium hydroxides, aluminum sulfate and ammonium nitrate, the anodic system appears to have immediate application.

Metal Limitations: Some metals can't be passivated—copper, for example. But iron, titanium and chrome- and nickel-containing alloys can be. There is a question as to whether anodic protection will promote stress cracking, although Conoco has had no trouble so far at Baltimore, Chicago, or Gretna, La., where it has installed systems.

One drawback, say many engineers, is that considerable laboratory work is required to determine whether or not anodic protection can be applied to any plant process. Moreover, if it can be applied, accurate

* Actual cost: $0.0074/day based on electric rate of $0.03/kwh.

† In anodic protection, the equipment being protected is the anode; current flows to a platinum electrode (the cathode). In cathodic protection, the equipment being protected is the cathode.

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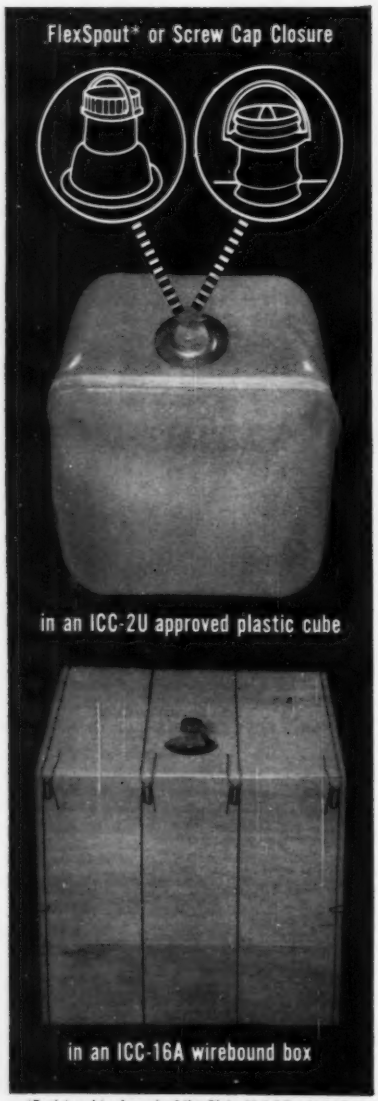

*Registered trademark of the Rieke Metal Products Co.

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determination of the critical current range is a must.

An engineer at one company feels that experimental work and development of the details of the system needed to protect a plant process may outweigh the cost of using a more expensive material known to give the required protection.

However, Honeywell's Rubicon Division (Philadelphia), which will be making and marketing the system, says it will help firms carry out experimental work. There is also university research work planned on the anodic system that may help produce much data now lacking.

Foolproof Method Wanted: Much of the resistance that Rubicon will face will probably come from corrosion engineers' desire to have a foolproof system. "When you put in the first anodic system, you can be sure it will work all right because the engineers will be swarming all over it. But once the novelty wears off, we'd be worried about whether the operators in the plant could detect faulty or nonoperating conditions. And if it weren't working right, we'd be in worse shape than if we used a more expensive corrosion-resistant material of construction in the first place," says one engineer.

Another engineer points out that cathodic protection, which doesn't require sensitive controls, hasn't found great favor in many process applications. And, even in pipeline applications, some companies are trying to eliminate the need for cathodic protection by using plastics.

Researchers point out that anodic systems not only require much less power to operate than cathodic systems but also can be made with fail-safe controls. And anodic systems can be used to measure process corrosion as well as protect against it. If the process conditions change, making the chemicals more corrosive, the current needed to maintain the protective oxide film on the equipment will also change. The change is claimed to be detectable, and a warning system could be developed to notify the operating department. Such a system might give anodic protection an edge even if corrosion-resistant materials of construction were less expensive.

Right now cost of the Anotrol system is a question mark. Rubicon says that product engineering work is still to be completed. And, of course, no Anotrol system will be an off-the-shelf item. Cost will depend on the process equipment to be protected. Also, since it is an electronic system, explosionproof construction —a cost booster—will be needed for many process applications.

Most corrosion engineers now look at anodic protection as just one more corrosion tool—good, but with limited application. Rubicon basically agrees. The question is what the application limits will be. And that will depend on future application research and how well Rubicon can overcome the naturally cautious attitude of the chemical industry.

EQUIPMENT

Gas Turbine: Westinghouse Electric's industrial gas turbine department (Box 2278, Pittsburgh 30) is out with a new self-contained gas turbine power package that can be put into operation in less than two weeks after delivery. The units, with 3,000-, 7,000- and 12,000-kw. ratings, are designed for peaking and reserve-capacity operation. They require only 3-ft.-thick, flat concrete-slab foundations, can be installed for as little as $80 per kw., based on winter operation; $100/kw., summer.

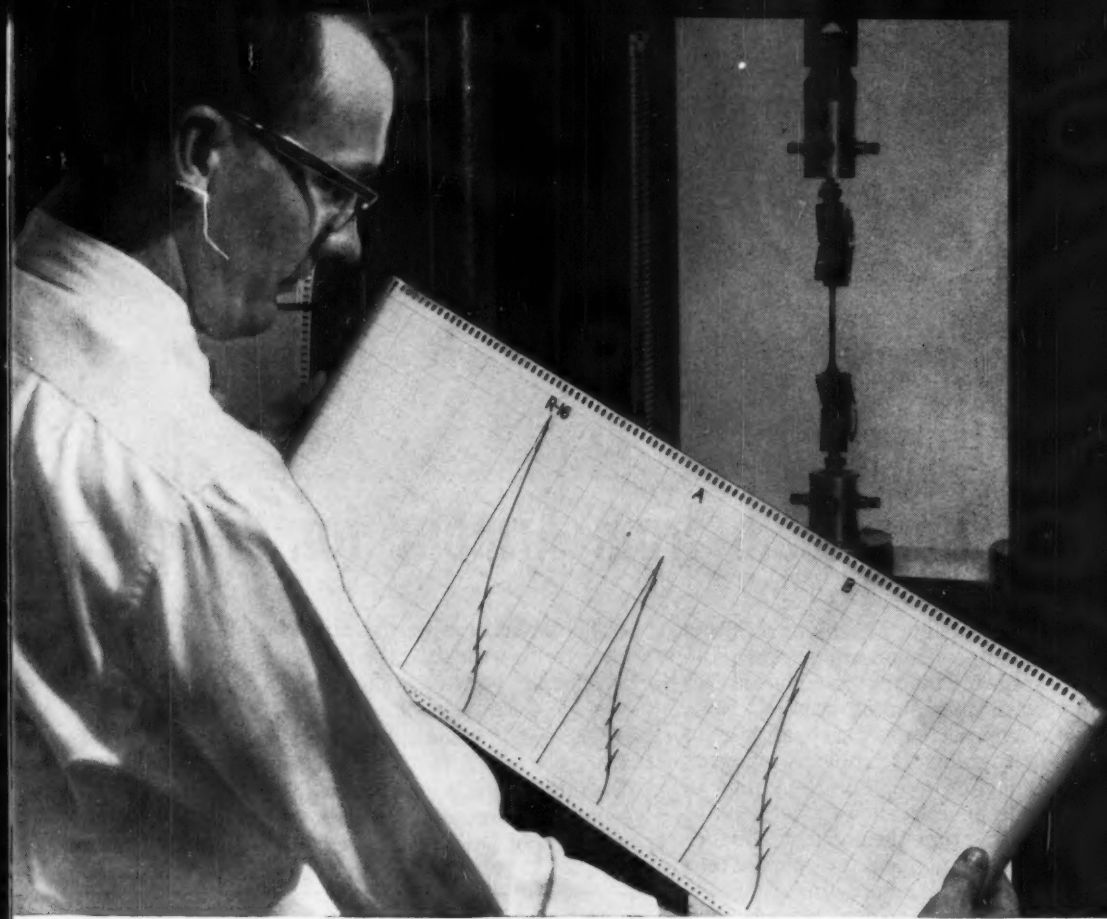
•

Pipe Coating: Dearborn Chemical Co.'s (Merchandise Mart Plaza, Chicago 54) new epoxy pipe coating is claimed to have rapid curing rate, good resistance to physical impact, abrasion, moisture and chemicals. The coating, called Dearclad 765, retains its physical properties from —40 to 250 F. Offered as a two-component system that is blended at the use point, the coating can be applied with brush, roller or airless-type spray equipment.

•

Tube Flarer: A cartridge-actuated flaring tool for light and heavy wall tubing is a new product of Parker-Hannifin Corp.'s Parker Fittings & Hose Division (Cleveland).

Firing (tapping) an inserted cartridge increases the clamping force and the firing cone plunges about an inch into the tube, forming and coining the flare. The tool is available with five sets of flaring dies for ½-, ⅝-, ¾-, 1- and 1¼-in. outside-diameter tubes.



Dr. Stanley Jankowski, one of Neville's senior chemists, is shown here holding a test chart showing the results of tensile testing three aged rubber samples. The chart is just as it came from the Instron Tester, except that scribe lines have been inked over and labeled for visability in the picture. They have not been changed. From left to right, samples contained Neville's R-16 Coumarone-Indene Resin, competitive resin A and competitive resin B. Detailed results are shown below.

Competitive tensile test shows Neville Resin superior

Neville's R-16 Coumarone-Indene Resin was matched against two other leading resins in a neutral colored SBR test recipe compounded for comparative analysis. The results were as follows:

	Average Tensile	Aged Average Tensile	% Tensile Retention
Neville's R-16	1830 psi	1400 psi	76.5
Competitor A	1680 psi	1150 psi	68.5
Competitor B	1655 psi	1275 psi	77.2

Beyond superior tensile strength, there are other benefits derived from compounding rubber with R-16 Neville Resin. Elongation, both before and after aging, is exceptional and considerable aid to processing is enjoyed. Better mold flow and easier dispersion of fillers are also realized in using R-16 Neville Resin. Use the coupon to write for further information.

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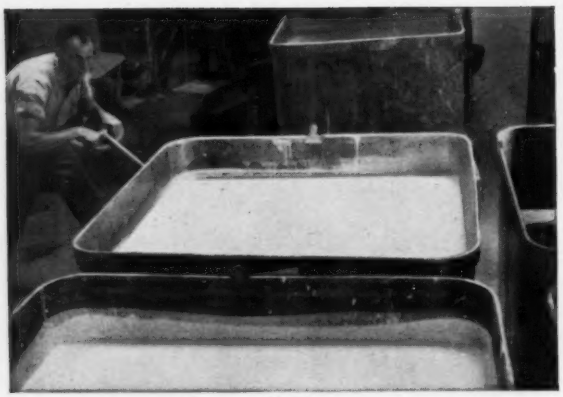
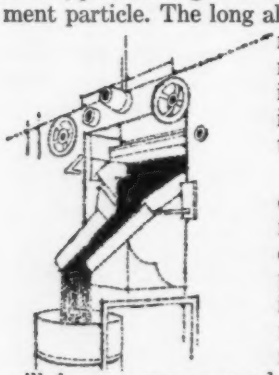


Chemicals from Armour for Pigment

Dispersion of pigments in paint, plastics or rubber is an expensive time- and power-consuming operation. Various materials are being used as "grinding aids" or "wetting agents" with only limited success. Now, Armour *cationic* chemicals supply the answer to rapid and effective dispersion of "problem" pigments where other agents have failed. The flexibility in application of these chemicals allows treatment at any time . . . either at the time the pigment is manufactured or at the time the pigment is dispersed into the medium. These chemicals have definitely established themselves as useful, time- and power-saving aids for pigment dispersion.

Paint and Pigments

Armour's *cationic* surface active agents possess a high degree of affinity for pigment and filler surfaces in the presence of oil or water. The cationic molecule orients itself on the surface of the pigment so the active, polar nitrogen is directly attached to the pigment particle. The long alkyl chain completely surrounds each individual pigment particle and alters its surface properties, causing the pigment particle to be readily oil-wetted.



Use of Armour *cationic* chemicals results in the following advantages: elimination of sweating period, reduction of grinding time, higher grind number reached with fewer passes through roller mill, less power consumed, and less pigment separation in stored paints.

Cationic treatment of pigments can be accomplished at either of two stages. The first involves pretreating the pigment prior to its incorporation into an oil or oleoresinous base. The second method adds the chemical directly to the vehicle or to the pigment-oil paste just prior to grinding. Armour's Duomeen® T (aliphatic diamine) Dioleate is equally effective in either method of use.

The necessary concentration for effective dispersion varies with the type of pigment, but the range is generally between 0.5% and 3.0% based on the dry weight of the pigment.

The table below illustrates the effectiveness of Duomeen T Dioleate in dispersion of Titanium Dioxide (RANC) in a typical alkyd on a 3-roll mill. Note the increase in ratio of pigment to vehicle when 1% of Duomeen T Dioleate is used.

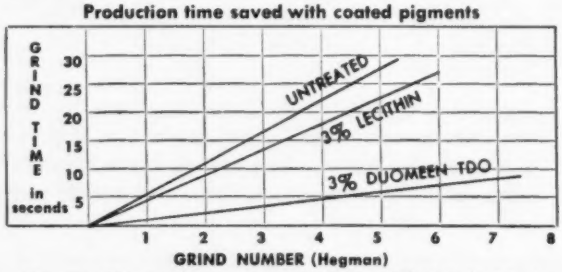
Dispersion of Pigment

Vehicle..... 32% Phthalic Anhydride Alkyd
Vehicle Non-Volatile.. 50% In Mineral Spirits
% Wetting Aid..... 1% Based on Pigment Weight

	Control		Lecithin		Duomeen TDO	
	Lbs.	Gal.	Lbs.	Gal.	Lbs.	Gal.
Titanium Dioxide.....	970	27.8	1060	30.3	1170	33.5
Vehicle.....	547	72.2	521	69.7	500	66.5
Wetting Aid.....	....	....	10.6	....	11.7	....
Total Pounds of Paste...	1517	100.0	1591.6	100.0	1681.7	100.0
Increased Pounds of TiO_2	....	....	90.0	....	200.0	....
Increase % of TiO_2.....	....	....	9.3	....	20.6	....

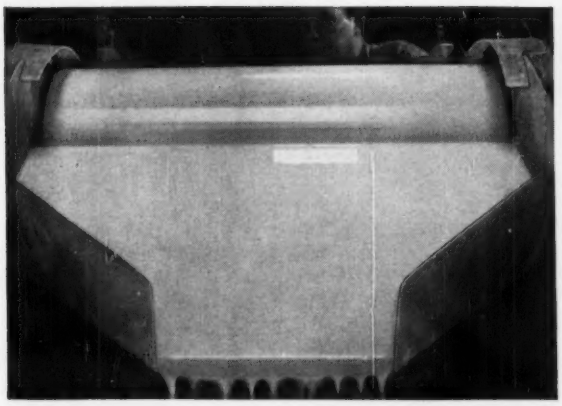
The following graph indicates the relationship of grind time to grind number and illustrates the obvious advantage from the use of Duomeen TDO.

Production time saved with coated pigments



Pigment—Chrome Green Vehicle—24% Phthalic Alkyd (50% non-volatile in M.S.)

Duomeen TDO is effective for rapid dispersion of titanium dioxide, white lead, chrome yellow, calcium carbonate, ultramarine, chrome green, iron blue, toluidine red, black iron oxide, red iron oxide, zinc



Dispersion

oxide, chrome orange, lithophone and zinc chromate yellow.

Duomeen TDO can also be used in pigment flushing techniques. This is accomplished by mixing the water-wet pigment cake into an oil treated with the cationic chemical.

Mixtures of Arquad® 2S (quaternary ammonium chloride) and Ethomeen® S/12 (polyethoxylated amine) are also highly effective coating and wetting agents for pigment-oil systems.

Plastics

The combination of Armour's Arquad 2C and Ethomeen S/12 is used as a coating agents for pigmentation of plastics and plastisols. The use of cationic coated pigments offer numerous advantages in production and in the finished product.

By using pigments coated with these chemicals, manufacturers can lower initial viscosity, improve viscosity stability in plastisols, maintain longer working periods for the plastisols and reduce water and soapy-water extraction. Coatings of Arquad 2C and Ethomeen S/12 will also permit reduced processing time for inclusion of the pigment into the plastisol.

Rubber

Incorporation of precipitated calcium carbonate as a reinforcing agent in rubber is a difficult operation. Precoating the pigment with Armour *cationic* chemicals greatly facilitates the incorporation. Precipitated calcium carbonates may be treated in aqueous slurries by a simple process in which a mixture of 5 parts of Arquad 2C and 1 part of Ethomeen S/12 acetate is added to the slurry. A dilute solution of sodium hydroxide is then added to react with the Ethomeen S/12 acetate which releases sodium acetate and deposits a uniform Arquad/Ethomeen coating on the surface of each pigment particle. The sodium acetate is then removed by simple water washing.

Precoating the pigment in this manner changes the surface character from hydrophilic-oleophobic to hydrophobic-oleophilic, and allows the pigment to be more readily wetted by organic media.

NEW DEVELOPMENTS FROM ARMOUR

Gas Chromatography for higher product standards

Initially, Gas Chromatography was introduced in Armour laboratories as a research tool. Now, it is an integral part of quality control on production runs at the McCook, Illinois plant. Our GC was the first to be used by a producer of fatty acids. Using gas chromatography permits more rapid and exact product analyses . . . enabling us to maintain the highest purity standards in fractionated and distilled aliphatic nitrogen derivatives.

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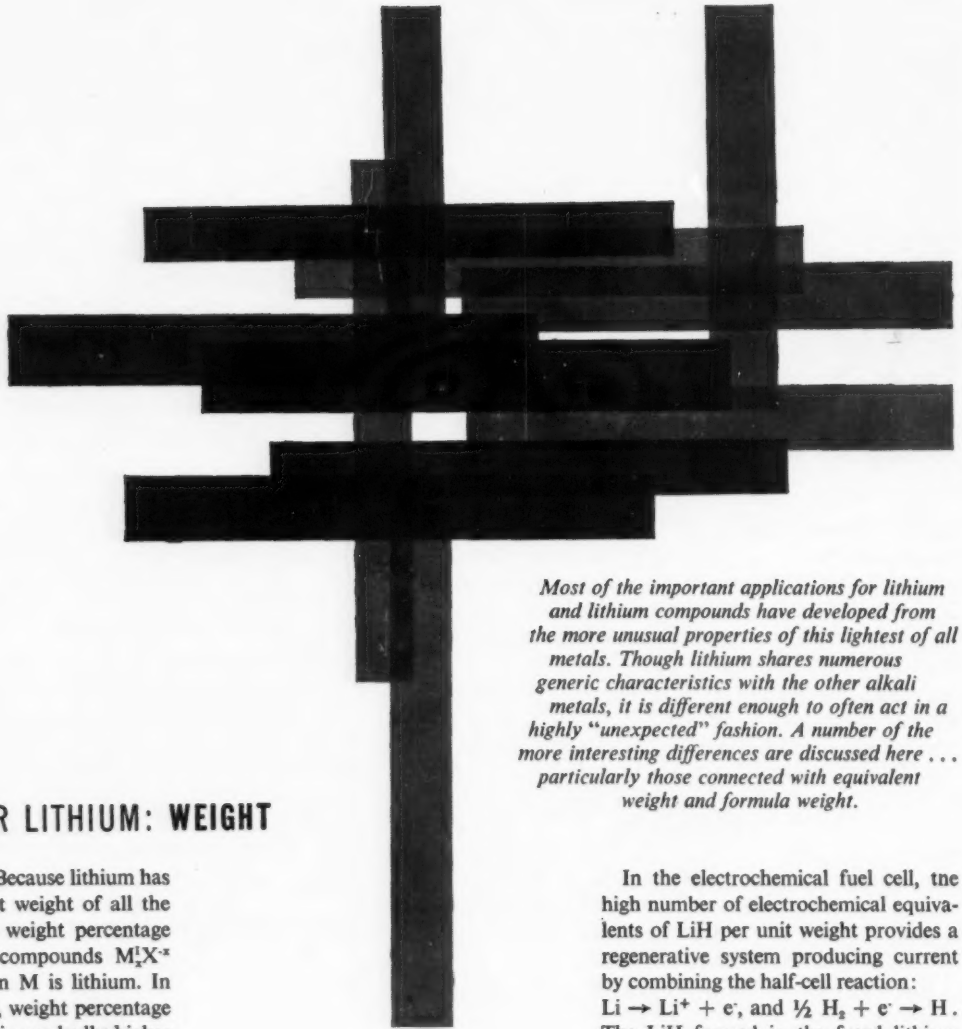


Most of the important applications for lithium and lithium compounds have developed from the more unusual properties of this lightest of all metals. Though lithium shares numerous generic characteristics with the other alkali metals, it is different enough to often act in a highly "unexpected" fashion. A number of the more interesting differences are discussed here . . . particularly those connected with equivalent weight and formula weight.

THE CASE FOR LITHIUM: **WEIGHT**

EQUIVALENT WEIGHT Because lithium has the lowest equivalent weight of all the alkali metals (6.94), weight percentage of the anion X^{-x} in compounds $M^{I}_{x}X^{-x}$ will be greatest when M is lithium. In $MC1O_4$, for example, weight percentage of available oxygen is markedly higher in *lithium* perchlorate . . . to the extent that on a volume basis, there is 29% more oxygen in lithium perchlorate at room temperature than in liquid oxygen at its boiling point.

Similarly, lithium hydride provides the highest content of available hydrogen (chemical reaction equivalents or gas) . . . lithium hypochlorite the highest content of active chlorine . . . and lithium nitrite the highest nitrogen content per unit weight of reaction mixture: ($MNO_2 + NH_4Cl \rightarrow 2H_2O + N_2 + MCl$).

WEIGHT PERCENTAGE OF AVAILABLE OXYGEN

M	$MClO_4$	MNO_3
Li	60.1	58.0
Na	52.0	47.1
K	46.2	39.6
Rb	34.6	27.3
Cs	27.5	20.5

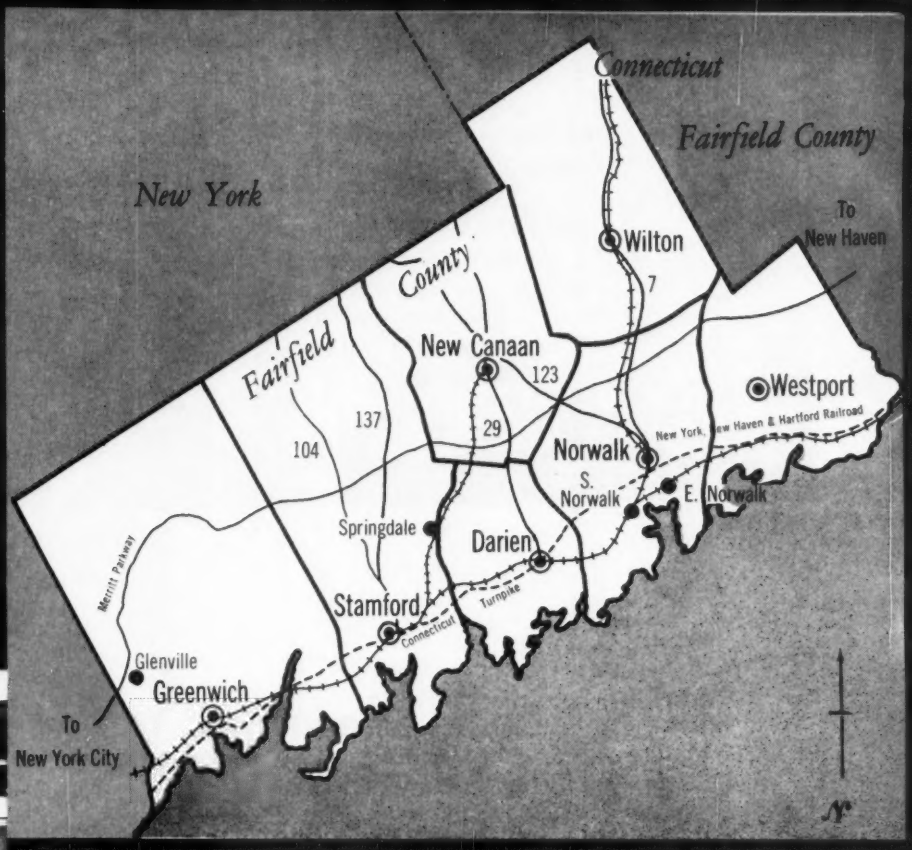
The relatively large number of moles of material per unit weight makes lithium salts ideal fluxes or liquid formers, and freezing point depressants. This can prove of considerable consequence in reactions facilitated by a liquid phase through which reactants can readily diffuse. Relatively small quantities of lithium salts added to high temperature electrochemical processes can depress freezing points, increase fluidity, decrease viscosity and, at the same time, increase electrical conductivity.

FORMULA WEIGHT Lithium hydride's low formula weight makes it ideal for two interesting applications . . . a heat sink and an electrochemical fuel cell. In the heat sink, the high heat of fusion of LiH per unit weight provides a thermal energy source in the conversion of thermal to electrical or mechanical energy.

In the electrochemical fuel cell, the high number of electrochemical equivalents of LiH per unit weight provides a regenerative system producing current by combining the half-cell reaction: $Li \rightarrow Li^+ + e^-$, and $\frac{1}{2} H_2 + e^- \rightarrow H^-$. The LiH formed in the fused lithium salt electrolyte of the cell is then thermally decomposed by a nuclear reactor to regenerate the reactants.

MORE TO COME The tale of lithium is neither quickly nor easily told. The material presented here constitutes the briefest of introductions. But if it has whet your appetite we can happily provide you with a great deal more of the same . . . long on facts and ideas, short on flim-flam, and complete with derivations and references. Just write for a copy of "Lithium vs. The Other Alkali Metals". Foote Mineral Company, 420 18 West Chelten Building, Phila. 44, Pa.

FOOTE
MINERAL COMPANY



CPI-Related Laboratories in Southwestern Fairfield County

Stamford
* Acme Battery Corp.
Affiliated Research, Inc.
* Alpha-Molykote Corp.
American Cyanamid Co.
Aries Assoc.
* Barnes Engineering Co.
* Branson Instruments, Inc.
Crawford & Russell, Inc.
Diamond-National Corp.
* Northam Warren Corp.
* Stamford Rubber Supply Co.
Standard Brands, Inc.
* Marvin R. Thompson, Inc.
White Development Corp.

Springdale
American Machine & Foundry Co.
* Polymer Industries, Inc.
Time, Inc.

Glenville
* American Felt Co.

Greenwich
American Machine & Foundry Co.
* Canada Dry Ginger Ale, Inc.

Norwalk
* Perkin-Elmer Corp.

E. Norwalk
* R. T. Vanderbilt Co.

S. Norwalk
* Ames Laboratories, Inc.
* Charles of the Ritz, Inc.
* Duke Laboratories, Inc.
* Edcan Laboratories

Wilton
Escambia Chemical Corp.
Fred T. Roberts & Co.

Westport
Dorr-Oliver, Inc.
Donald K. Tressler Assoc.

** Includes manufacturing facilities*

Stamford: Self-Styled Lab Haven

Zoning changes are opening new opportunities for locating research laboratories in Connecticut's Fairfield County, particularly in the communities that have long been predominately—and staunchly—residential.

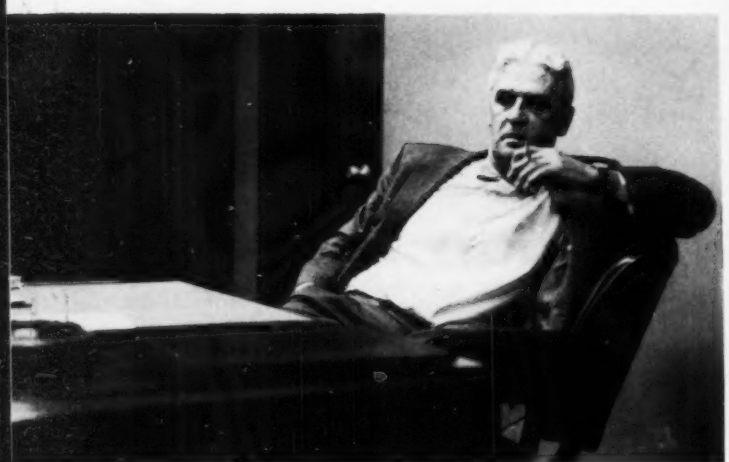
Led by Stamford, the towns, clustered along a 15-20-mile stretch of Long Island shore land, have found it worthwhile to allow CPI companies to build the research centers. And the companies, in turn, have found staffing and operating problems sharply reduced in these areas.

Stamford, which dubbed itself "The Research City" in '58, is especially seeking to attract new labs. Labs already there find the civic and industrial environment to their liking, and some are expanding. In September, for example, Polymer Industries, Inc., will dedicate the newly completed, $1-million addition to its facilities in the Springdale section of Stamford. And American Machine & Foundry's Research & Development Division has added more than 50% to the working area at its Springdale labs (which were also modernized) and is finishing up a new pilot plant.

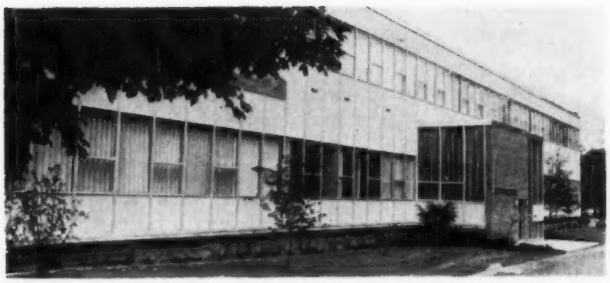
'Research City': When Stamford claimed its "Research City" title it acknowledged a transformation that had been gradually taking place for about 20 years. As new laboratories were established in the area during this period, Stamford's principal industry was gradually moving out. This was the Yale & Towne Mfg. Co., which had given the city its previous title, "The Lock City." (Y&T's moves have reduced its Stamford payroll

Frank Campins, president of Polymer Industries, sets pace for his researchers, spends part-time in labs.

Local Executives Link Stamford with Research Image

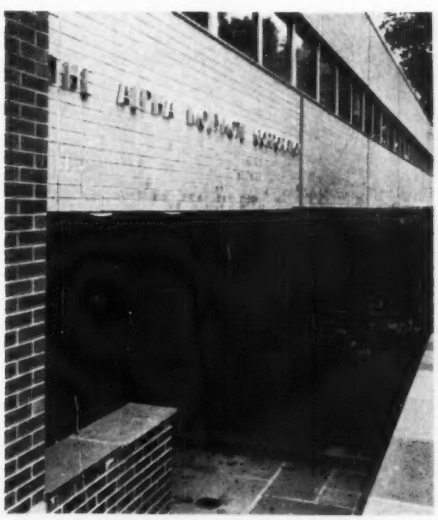


American Cyanamid, which converted an old silk mill into its corporate research center in '36, finds Stamford a pleasant home, according to lab Director Alfred Peiker (*left*) and Central Research Division General Manager James Bourland.



William Cadogan heads AMF's proprietary chemical research, including plastic coatings for bowling pins. Establishment of a new R&D Division last year led the company to give its Springdale lab a new face as well as plenty of extra space.

Alpha-Molykote Corp. is big in its field (solid lubricants), had to move from Greenwich to a more liberal zone in Stamford, where it put up this new manufacturing plant. Vice-President David Noltie's research team is there, too.



from a peak of 6,000 to only 200.

Two men with a particular interest in seeing Stamford's research activities grow are Mayor Walter Kennedy and the executive vice-president of the Stamford-Greenwich Management Council, Dean Brossman. Their attitudes typify the changes in Fairfield County communities. For example, the council (which recently changed its title from "Manufacturers'" to "Management," to include research operations in its activities) is cooperating with the city in getting research buyers for city-owned land.

Mayor Kennedy tells CHEMICAL WEEK that, in addition, the city hopes provision will be made for research land on the outskirts of a $100-million urban renewal project that will cover 66 acres in the heart of the city. Price is likely to be high, though; asking price for a nearby industrially zoned 10-acre tract is $30,000/acre.

Rezoning Problems: Rezoning land for a new laboratory isn't an easy matter, however, even in Stamford, which has done more in this line than its neighbors. People who moved to the area for an undisturbed residential atmosphere may interpret any rezoning move as an open door to "industrial nuisance and hazard," even if land is to be used only for a lab.

AMF's Greenwich Engineering Division bought 35 acres along the Merritt Parkway for use as a new Central Engineering Center, but has been opposed in the courts by a small group of citizens. The change has been approved by the Stamford zoning commission and, according to AMF, is "favored by 99% of the residents." But a state supreme court ruling that access roads were inadequate has prolonged the litigation until the roads are improved (now being done by the state and the city).

Such opposition is becoming less likely all the time, says Mayor Kennedy, because of the increasing experience of more residents in living with the existing laboratories. In particular, he points to the new CBS Laboratories situated in a once-residential zone. Preliminary community relations work by the company sold the residents on the idea, and the completed lab is helping to break the ice for more new projects that can offer the community tax revenue, high-grade personnel and a pleasant appearance.

Residential Area Research: The nearest thing to a "research row" in the area is Stamford's Hope Street, in its Springdale section. Only a quiet residential street to a passing motorist, Hope Street displays its industrial character only through an occasional small sign that announces the existence of a laboratory or plant driveway.

Both Polymer Industries and AMF's R&D Division are on this stretch. Polymer moved into the area in '51, consolidated all its facilities there in '54. Reason: previous locations in Brooklyn and Queens, N.Y., were too cramped, involved stringent fire-law restrictions on work with solvents. The firm, which was acquired by Philip Morris, Inc., in '58, embarked on its latest expansion last year. The first phase, completed in January of this year, included a full floor of laboratory space. A polymerization pilot plant is part of the newest expansion.

AMF's Springdale laboratories date back to the mid-'40s, says William Cadogan, manager of the chemical laboratory. Since then the facility had grown to the point where it was made a separate division last year, responsible to AMF's vice-president and director of research and development, Hamilton Herman, for the company's proprietary research. Total floor space after the expansion is about 75,000 sq.ft. Chemical R&D accounts for approximately a third of this area, representing an investment of about $1 million for building and equipment.

Pioneer Facility: Although not old by many standards, American Cyanamid's Stamford research center is generally cited as the first large research

Dean Brossman, executive vice-president of the Stamford-Greenwich Management Council (*above*), works closely with Stamford Mayor Kennedy (*right*) in smoothing relations between research and residents.

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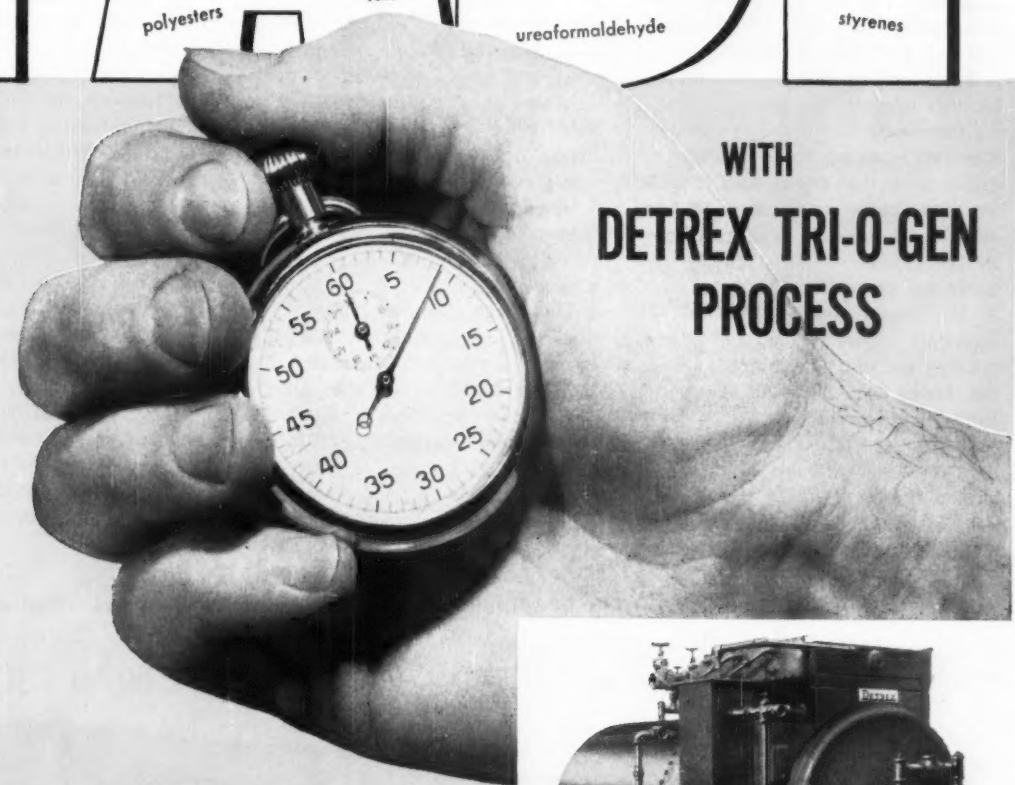

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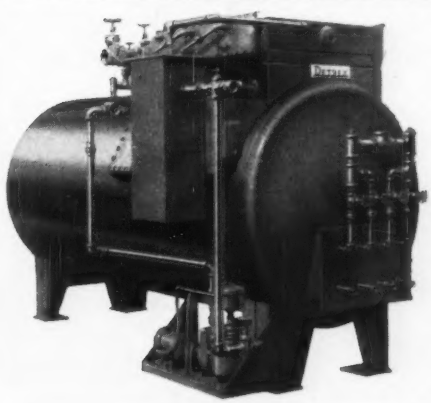

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facility in the area. Started in '36, when the company bought an old silk mill to house its research, the Stamford laboratories now have a 1,000-man staff. Says James Bourland, general manager of the Central Research Division: "This is as big as we expect to get here," but he adds that space now occupied by divisional research will gradually be freed for expansion of corporate research.

Director of the Stamford labs, Alfred Peiker, points to Stamford's residential atmosphere and good transportation facilities as reasons why companies like the area. The Merritt Parkway, Connecticut Turnpike and New Haven Railroad offer good east-west transportation. And a heliport in downtown Stamford gives the area a fast link with New York airports.

Recent growth of local educational facilities is another factor that's making the closely bunched towns around Stamford more attractive to research. Peiker notes that experienced laboratory technicians are not easy to find locally. As a result, Cyanamid has worked closely with the state in establishing chemical courses at the J. M. Wright Technical School, a secondary school that opened a new building last year in Stamford, and at the higher-level Norwalk Technical Institute now being built.

Courses for researchers have also been available through evening extension courses given by the University of Connecticut in downtown Stamford. And the university is now constructing the first building for a new campus in the northern part of the city. Significantly, it will be a science building.

Changing Attitudes: The towns adjoining Stamford—Greenwich, New Canaan and Darien—haven't shared its enthusiasm for research, but at least two of them are now reconsidering their position.

Greenwich is, in fact, the home of what is probably one of the oldest labs in the area. The American Felt Co. was formed in the town's Glenville section in 1899. The company's Engineering and Research Division now carries on basic fiber research there in conjunction with the development of new wool and synthetic felts.

Although jealous of its residential reputation, Greenwich recently rezoned one small area to attract office buildings and research laboratories. Now under consideration is the rezoning of 600-700 acres in the northwest part of town.

New Canaan, which had been even more conservative, has also moved to attract research by rezoning, but will have to prove its case in court before the new regulations take effect. The town's zoning commission has taken pains to guarantee that facilities built on the land will be desirable. Among the limitations imposed: 50-acre minimum site, with maximum of 5% land coverage; maximum of 15 employees/acre, with no more than 1,000 in all; no manufacturing or pilot plants. Price: about $3-5,000/acre.

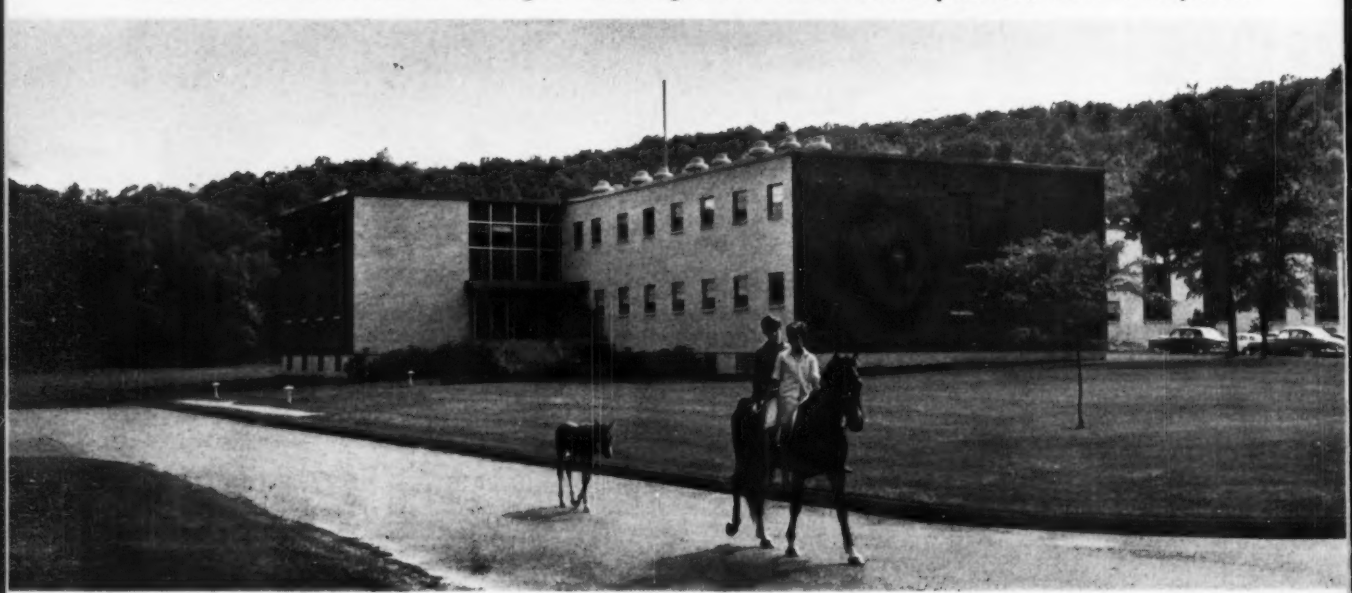
Happy Experience: The town of Wilton, just east of New Canaan, rezoned an area for research when Escambia Chemical Corp. proposed a research center, including a pilot plant (*CW, Nov. 24, '56, p. 98*). The center, opened in '58, covers 55,000 sq.ft. of a 45-acre site. Research Director Mayo Smith and the town's first selectman, Vincent Tito, agree that relationships between the center and its neighbors are now most agreeable.

Based partly on its favorable experience with Escambia Chemical, Wilton has gradually been rezoning more land as more companies have expressed a desire to move in. The latest: Perkin-Elmer Corp., whose 30-acre site in Norwalk borders on Wilton's south boundary. P-E has expanded floor space from 50,000 sq.ft. to over 200,000 sq.ft. since it bought the Norwalk site in '49. It plans to move engineering and other activities to the new Wilton site, on which the firm will erect a building with nearly 100,000 sq.ft. of floor space.

Norwalk has long been an industrialized town; its laboratories are all connected to manufacturing facilities. But nearby Westport is just the opposite, with a very closely guarded residential reputation, although it is the home of Dorr-Oliver's research lab.

Despite isolated objections in some communities, research operations are being welcomed in Fairfield County, Connecticut—especially when residents are convinced of advantages to the community.

Escambia Chemical's 45-acre setting in Wilton gives its researchers a peaceful, rural atmosphere.



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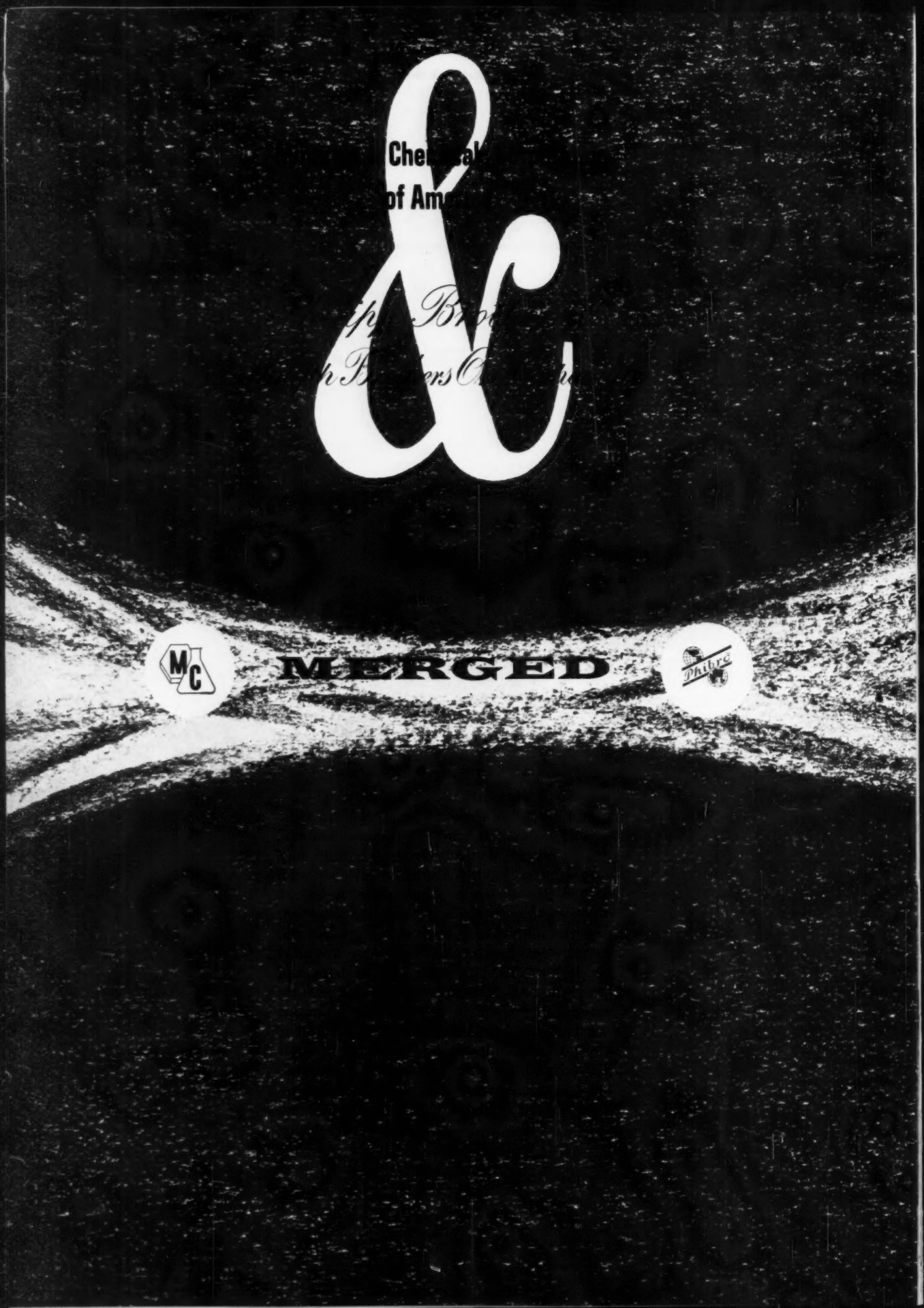
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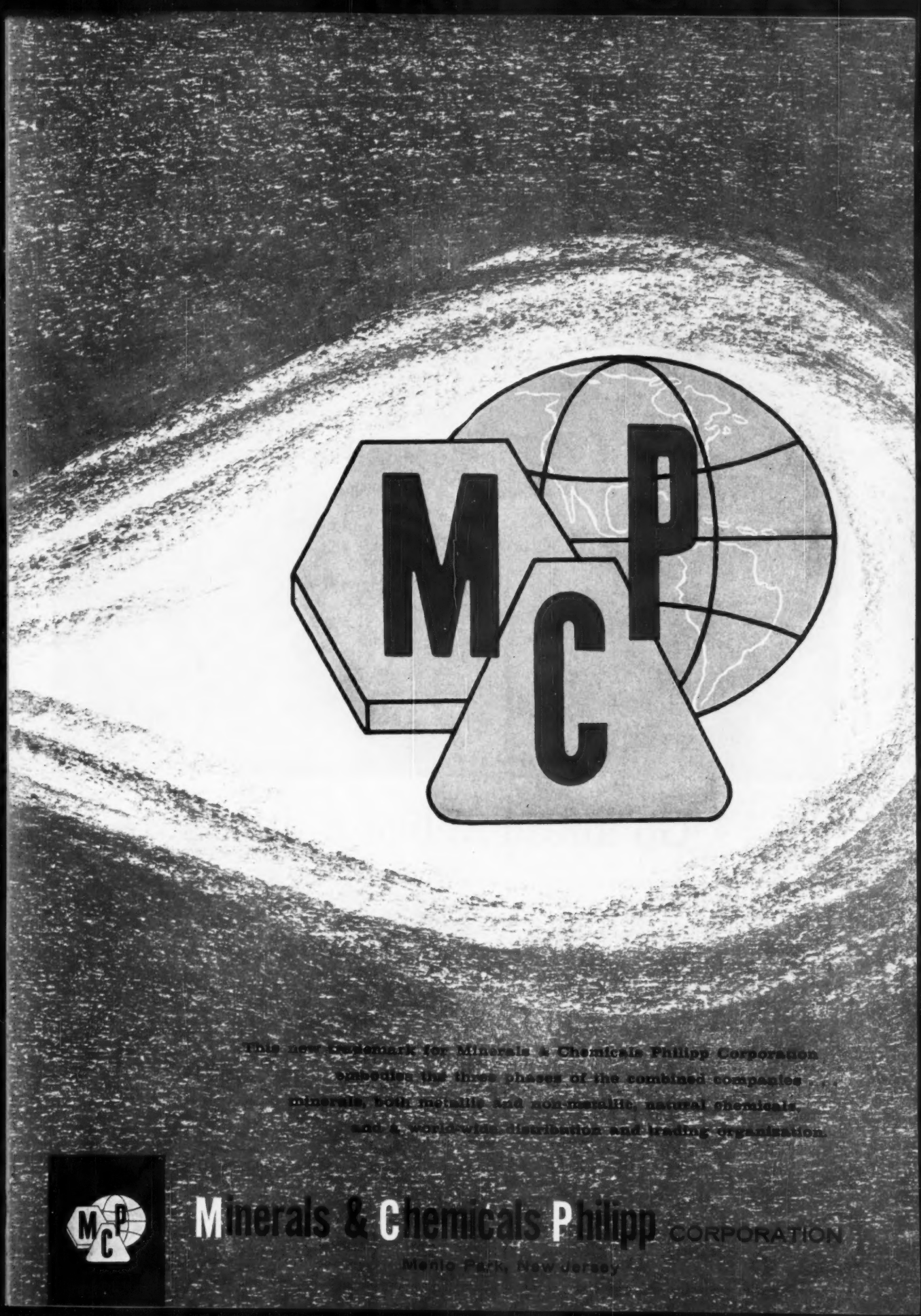

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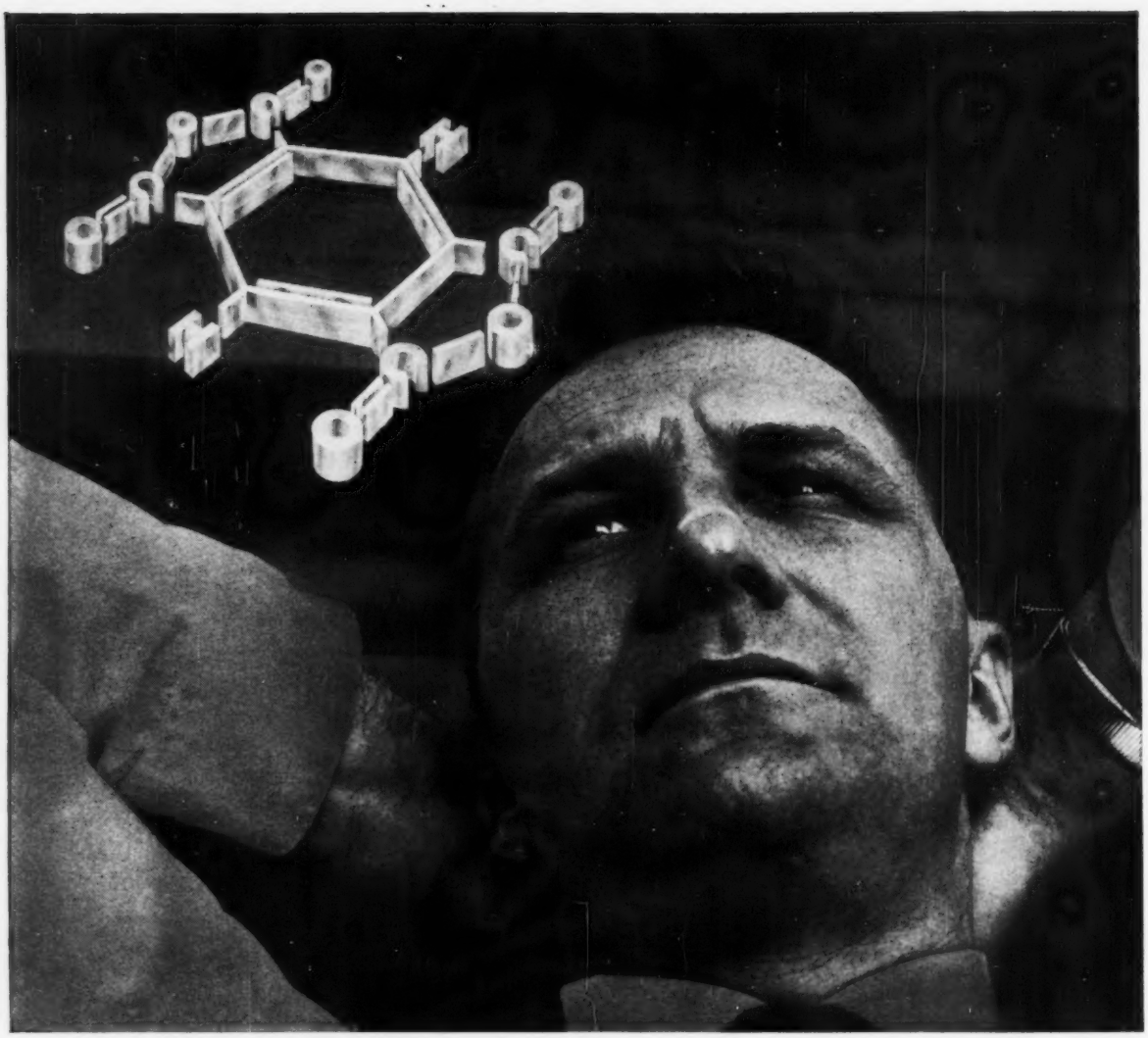

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BETTER THINGS FOR BETTER LIVING... *THROUGH CHEMISTRY*

Pro and Con of 'Agreed' Freight Rates

FOR:

Agreed rates allow lower rail transportation costs to shippers, more volume for the embattled rails. "One way or another, this kind of rate will eventually take hold because it's needed," say CPI shippers and railroads.

AGAINST:

An Interstate Commerce Commission examiner contends that agreed rates are illegal, that they violate the nation's antitrust laws. What's needed, says the Commission, is special legislation allowing this kind of rate-making.

CPI Shippers Rush for 'Agreed' Rail Rates

Chemical shippers are still highly enthusiastic about chances of cutting their rail transportation costs through the use of "agreed" or "guaranteed" rates for large-volume shipments. This optimistic attitude prevails despite the just-issued report of an Interstate Commerce Commission examiner holding that agreed rates are illegal and should be voided (CW Market Newsletter, Aug. 20).

Moreover, railroads aver they will continue their battle to win new business by using agreed-rate arrangements—and CPI freight stands high on their list.

Currently, more than 50 million tons of chemicals and allied products move over the rails annually, and the railroads feel they can hike that total considerably with new, cost-paring rates. Most likely commodities to be affected: fertilizers, cement, sulfur, liquefied petroleum gas, caustic soda, inorganic acids.

How They Work: Under agreed or guaranteed rates, a railroad grants a lower-than-usual rate to a shipper for a given interval, in return for a commitment to ship a stated (and usually high) proportion of traffic over that particular railroad. So far, no chemical shippers have ventured to make such arrangements. In fact, agreed-rate deals in any industry are extremely rare, largely because there has been no precedent for them in the U. S. (although such rates are in use in Canada and the U.K.).

Tests Case: Pushing hardest to win approval of the agreed-rate idea is the Minneapolis, St. Paul & Sault Ste. Marie Railroad (Soo Line). Starting nearly two years ago, the Soo has tried to get ICC approval for an agreed rate involving Mannesman Tube Co. Under the Soo-Mannesman arrangement, Mannesman agreed to ship 90% of its pipe over Soo tracks in return for a $2.13/ton drop in rail rate. (Previous rate: $12.53/ton between Sault Ste. Marie and Chicago.)

However, repeated suspensions of the proposal by ICC and Soo kept the rate from going into effect until April 24 of this year. At that time, the Soo Line insisted on putting the new rate into effect even though ICC had not yet acted on its proposal. Soo's reason: the St. Lawrence Seaway season was about to open, promising tough competition for pipe shipments.

CPI Shippers Surprised: Two weeks ago, ICC revealed its early thinking on the closely watched test case: agreed rates are illegal. That's the opinion presented to the full commission by an examiner who studied the matter.

The examiner in his report held that agreed rates violate the Elkins Act, sections 1-5 of the Interstate Commerce Act, and parts of the Sherman-Clayton antitrust laws by discriminating against shippers not party to the agreements.

This comes as a surprise to many CPI traffic men who had figured that the question of legality had been settled. It's true, of course, that the examiner's report must be accepted by the full commission and could still be overruled. In fact the examiner was sympathetic to the positions of the shipper and railroad involved in this case; he simply felt there was no legal foundation for the rate. But chances of any such overruling by the commission are considered slim by industry observers. And it's a good bet that the case may yet wind up in the federal courts for a fuller interpretation of the legality angle. In fact some observers feel that new legislation may be needed before agreed rates are able to stand unchallanged by ICC, and ICC agrees with this line of thinking.

Outlook: Regardless of the final disposition of the Soo-Mannesman case, it's clear that most CPI traffic men feel the railroads' new approach to rate-making will exert an influence on future rail freight rates.

Union Carbide's Assistant General Traffic Manager Frank Tighe puts it this way: "The agreed rate is very likely the forerunner of newer types of rail freight rates designed to meet particular competitive conditions, yet high enough to cover costs. Whether this test case upholds the agreed rate or not, we'll probably be seeing a lot more competitive rate-making from the railroads."

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How Motorists Buy

More U.S. motorists are buying regular-grade gasoline, and using credit cards to do it, than at any time during the '50s.

These are the highlights of a detailed study of motorists' buying habits just published by the Du Pont Co. (Wilmington, Del.). In the study, which is tabbed "Profile of the Motorist," Du Pont conducted 4,500 personal interviews to learn what, when and how motorists purchased automotive products.

Du Pont found that nearly 25% of those queried said they used oil company credit cards. In '56 only 18% said they used credit cards, and only 11.7% so answered the '52 survey.

In response to the question "Which grade of gasoline do you usually buy?" 58% reported regular, versus 50% in '56 and only 48.5% in '52.

Du Pont is now tabulating the answers to this year's survey and comparing responses with earlier ones to disclose significant buying shifts.

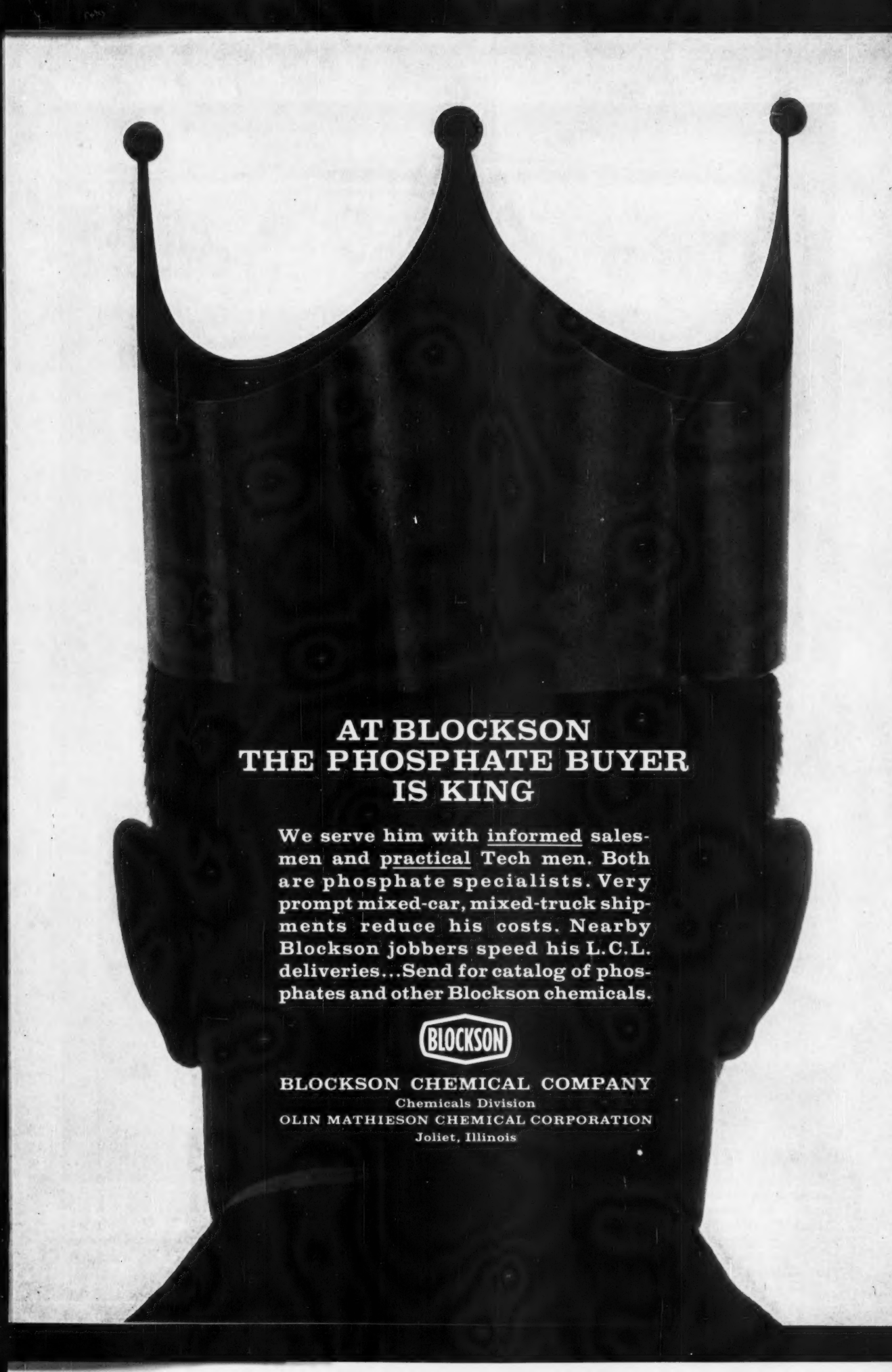
New Look on Labels

During the next few weeks, Allied Chemical Corp.'s National Aniline Division will begin to take on a "new look" in the eyes of customers and distributors. That's because the division is now knee-deep in a program to put a newly redesigned label on all its products, literature and advertising.

For National, the program marks the first time it has ever approached a uniform label design for the more than 3,000 products of the division. More significantly, the savings stemming from uniform label procurement might add up to more than 20% of the $500,000 that the division now spends for labels. And other Allied divisions are right now considering National's new label program. A distinct possibility: a corporate-wide uniform label design for Allied, based on National's work.

Too Many Labels: As National's product line has expanded, so has the number and variety of product labels on each of the many containers, ranging from 1-in-vials to tank cars.

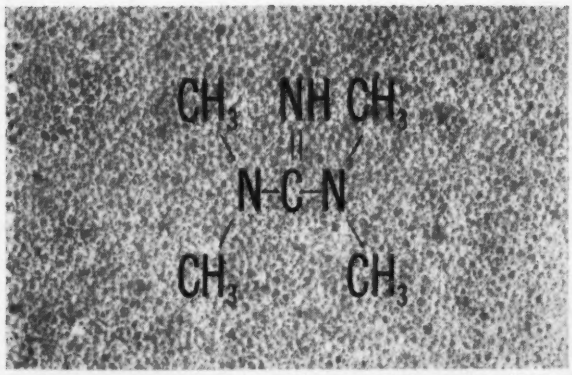
Originally, National concentrated on supplying dyes for the textile, paper and leather industries; certified colors for cosmetics, drugs and food prod-


AT BLOCKSON
THE PHOSPHATE BUYER
IS KING
We serve him with informed salesmen and practical Tech men. Both are phosphate specialists. Very prompt mixed-car, mixed-truck shipments reduce his costs. Nearby Blockson jobbers speed his L.C.L. deliveries...Send for catalog of phosphates and other Blockson chemicals.
BLOCKSON
BLOCKSON CHEMICAL COMPANY
Chemicals Division
OLIN MATHIESON CHEMICAL CORPORATION
Joliet, Illinois

CYANAMID

Chemical Newsfront

"ANTI-SUNBURN LOTION" FOR PLASTICS provided by Cyanamid's new CYASORB® UV 314 ultraviolet light-absorbing chemical. *Left*—A month in the Arizona sunlight renders a sample of polyethylene brittle as an eggshell. *Right*—When protected with only 0.5% Cyasorb UV 314, the same plastic remains flexible even after *four* months in the same sunlight. Cyasorb UV 314 works same wonders for polypropylene. Fiber, sheet, film, and molded plastics can now be light-stabilized. **(Intermediates Department)**



BETTER RIGID URETHANE FOAMS—with tetramethylguanidine (TMG). Kinetic studies show TMG favorably active on price-performance basis in catalyzing primary and secondary hydroxyl reaction with NCO. Anticipated advantages include ease of handling, better cross-linking, minimum odor in final product, and possibly improved aging under high humidity. **(Market Development Department)**

NEW SALES APPEAL FOR ACRYLIC FIBERS! Five Cyanamid CALCOZINE* acrylic dyes have a history-making new look. They require no expensive retarders—no modifications that weaken light fastness. In addition they permit ease of application, simplified leveling and stripping, deep penetration and high spotting resistance. Versatile, they work well with true or modified acrylics on all types of dyeing equipment. *Trademark **(Dyes Department)**

CYANAMID

AMERICAN CYANAMID COMPANY
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

ON THE CARPET! Cyanamid's ANTIOXIDANT 2246® forms only a small, but vital, part of the latex backing that locks carpet loops in place. It prevents oxidation, keeps rug coatings free of brittleness and cracking, and minimizes discoloration.

(Rubber Chemicals Department)

For further information on products in this advertisement, wire, phone—or mail this coupon to: CW-80

AMERICAN CYANAMID COMPANY
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Please send me additional information on

- ☐ CYASORB UV 314 LIGHT ABSORBER
- ☐ TMG
- ☐ ANTIOXIDANT 2246
- ☐ CALCOZINE ACRYLIC DYE

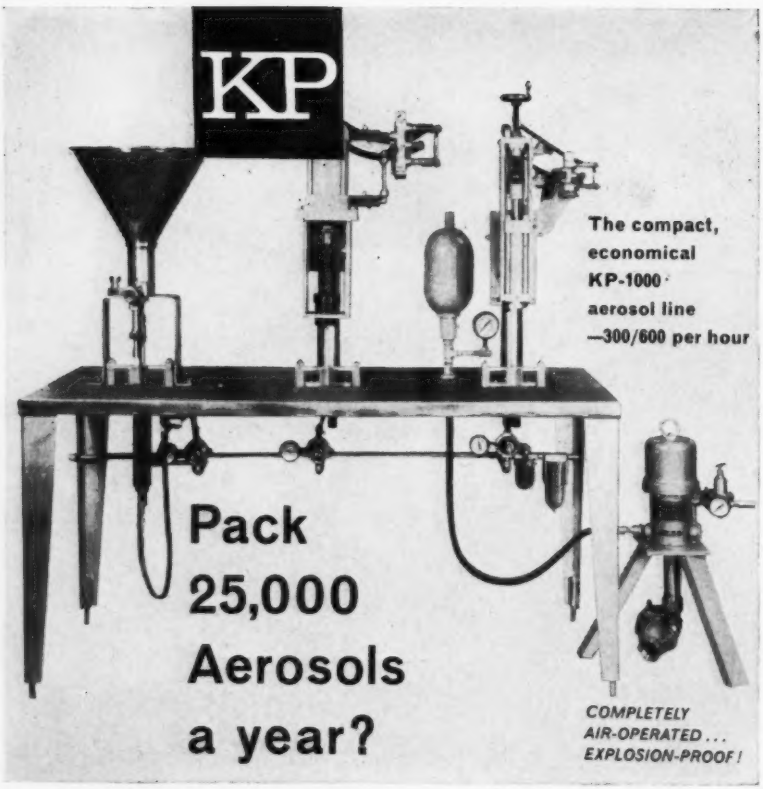
Name_____

Company_____

Position or Title_____

Address_____

City_____ Zone____ State_____


KP
The compact, economical KP-1000 aerosol line —300/600 per hour
Pack 25,000 Aerosols a year?
COMPLETELY AIR-OPERATED... EXPLOSION-PROOF!

Easy to operate, compact yet complete, the semi-automatic KP-1000 comprises a piston-type filler, a crimper, and a pressure filler. Whether or not you are packaging aerosols now, or only thinking about it, you should get the facts on this economical quality equipment.

KP-Mojonnier lines have filled—*and are now filling*—more aerosol cans than any other make of equipment. As the most experienced specialists in aerosols, Kartridg Pak offers you a single source, with undivided responsibility, for all aerosol packaging equipment. Every unit is engineered to function with the others.

For large-volume production, Kartridg Pak automatic lines have capacities up to ten million aerosols a year.

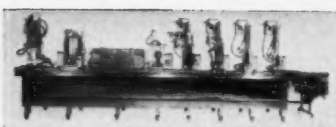
Laboratory equipment, for pre-testing your package, can be rented and the modest rental applied on the purchase.

Get all the facts fast

To have an area sales engineer call on you promptly, telephone us at Mount Prospect, Illinois, Clearbrook 3-2800, or write today.

THE KARTRIDG PAK CO.

Dept. W, 800 W. Central Road, Mount Prospect, Illinois



NEW "800" AUTOMATIC LINE for larger volume. Single or double track. Completely engineered throughout.

ucts; and indicators and biological stains for medical applications. In recent years, however, it has begun supplying new fields such as detergents, antioxidants, chemical intermediates and isocyanates. The result: burgeoning costs for many kinds of labels. Some labels used up to eight different colors.

To solve the problem, National called in John Sussileaux and Associates, New York-based industrial designing firm. Its recommendation: establish one basic label design, then produce it in various sizes and in only two colors.

As a result, National is now dressing up its products with the brand-new labels. Each label contains five horizontal bands—three colored, two white. The Allied logotype appears in the top, colored band. "National" (the registered trademark of all division products) appears in the next colored band—separated by a white strip, and a product description occupies the broad white band directly under this.

Distinctive colors have been assigned to each of National's major product lines: purple for detergents, blue for resin chemicals and green for isocyanates.

According to Allied spokesmen, there's a good chance that other divisions may not wait too long in following National's label redesign lead.

DATA DIGEST

• **Silicones:** Two new booklets outline uses of silicones in the chemical process industries (1-119) and in the automotive industries (1-118). Data covers uses of various silicone-containing products as lubricants, paints, water repellants, foamers and antifoamers, creams, rubber, plastics and fluids. Dow Corning Corp. (Midland, Mich.).

• **Peroxide Handling:** Safety data sheet (SD-81) outlines the properties, handling hazards, disposal and storage procedures for benzoyl peroxide. Cost: 30¢. Manufacturing Chemists' Assn. (1825 Connecticut Ave. N.W., Washington 9, D.C.).

• **Epoxy Adhesives:** New chart presents data on the types and uses of various epoxy resin adhesives. Furane Plastics Inc. (4516 Brazil St., Los Angeles 39).

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

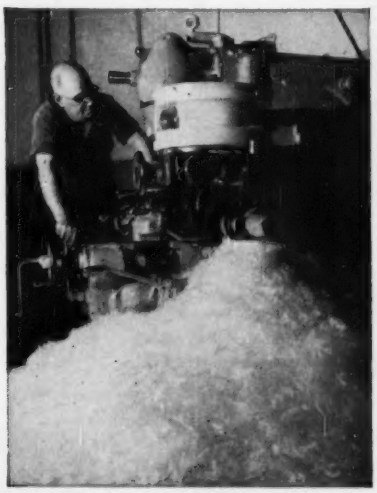
U.S.I. CHEMICAL NEWS

August 27 ★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1960

Polyethylene Used for Insulators in Nuclear Weapons Research Work

Two large polyethylene insulators, 18½ inches in diameter, have been made for use with a unique electrical switch in the discharge of heavy current loads from large condenser banks. Insulators and switch are reported to be part of research equipment used by nuclear physicists in the simulation and study of various aspects of nuclear weapons systems.

Polyethylene was chosen for its good insulating qualities, it is reported. Each insulator is said to be capable of withstanding voltages in the neighborhood of 100 kilovolts. The insulators were carefully milled to insure design compatibility with the special two-million-ampere switch.



Milling polyethylene insulator for use with unique electrical switch in nuclear weapons research. (Photo courtesy Boeing Airplane Co.)

New Chlorine Booklet Is Offered by U.S.I.

Facts about chlorine are detailed in a concise new booklet just released by U.S.I. Illustrated with photographs, drawings, graphs and charts, the 28-page booklet describes chlorine's chemical and physical properties in detail, and gives information on shipping, handling, safety measures and applications.

The company is preparing a similar publication on caustic soda which will be available shortly. For your copy of the chlorine booklet, write to the Technical Literature Dept., U.S.I. Chemical News, 99 Park Avenue, New York 16, N. Y.

Sodium Process Developed by U.S.I. Proves Economical for Desulfurizing Coke Oven BTX

Thiophene Levels in Benzene-Toluene-Xylene from Coke Oven Sources Reduced to Less Than 1 PPM. Purities Match Those Of Petroleum Products, with Treating Costs of Only 1-2¢/Gal.

Recent demands for low-thiophene benzene and toluene are creating new interest in desulfurization processes. To remain competitive with low-thiophene petroleum fractions, coke oven producers today must further treat their light oils to reduce thiophene content. Usual specifications are less than 1 ppm. Workable treating processes developed so far have proved economical only for very large scale coke oven operators who can invest in extensive equipment. The smaller operator has remained handicapped, and has been seeking methods involving lower capital outlay.

Recently, U.S.I. has been working with coke oven producers on the application of sodium desulfurization to this problem, with some very practical results. It has been found that, for only a little over a cent per gallon in treating costs, light oil feeds from coke oven sources can be purified to the desired levels. Further, this processing method is economical even for the small-scale producer.

Two U.S.I. Processes Available

Two general processes have been worked out by U.S.I. for the sodium desulfurization of light oil feeds in the vapor phase. In one, a mechanically agitated high-surface-sodium bed is used. In the other, vapor fluidized high-surface-sodium is employed.

Many samples of light oil from various parts of the country have been investigated in pilot units of these two types at U.S.I.'s research laboratories. The results of three such investigations, with calculated direct operating costs, are given in the

MORE

PILOT PLANT DATA—SODIUM DESULFURIZATION TEST RUNS

Acid-Washed BTX Sample	Process	Temp.	Na Level #/gal. feed	Contact time, sec.	Orig. thiophene content ppm	Final thiophene content ppm	Cost of treatment ¢/gal.*
A	Mechanically Agitated Reactor	450–500°F	.025#/gal.	10 sec.	45 ppm	less than 1 ppm	1.4¢/gal.
B	Fluidized Bed Reactor	450–500°F	.013#/gal.	10 sec.	1,000 ppm	less than 1 ppm	1.1¢/gal.
C	Agitated Reactor	450–500°F	.01#/gal.	10 sec.	170 ppm	less than 1 ppm	1.7¢/gal.

*These are total calculated operating costs—including raw materials, utilities, labor and maintenance—for 3 different locations and different capacities. Cost figures are therefore not comparable.

National Distillers—Food Machinery Joint Venture Gets Rocket Fuel Contract

Contracts for multi-million pound quantities of unsymmetrical dimethylhydrazine have been awarded by the Air Force Air Material Command to a joint venture of the Food Machinery and Chemical Corp. and the U.S.I. division of National Distillers. These contracts total more than $20,000,000. The material, called DIMAZINE* by the joint venture, is a storable, high-energy liquid rocket fuel.

FMC and U.S.I. pioneered in the commercial development of unsymmetrical dimethylhydrazine, and have been its principal producers for several years. The Air Force's DIMAZINE requirements will be produced in expanded facilities at Baltimore, Md.

DIMAZINE is a completely synthetic fuel. It is used with liquid oxidants in bipropellant engines of the type that power most of this country's large rocket vehicles as well as various smaller ones. Unsymmetrical dimethylhydrazine is unique in being the only synthetic fuel used in a substantial number and variety of the nation's operational rocket programs for scientific and military purposes.

*Registered Trademark of Food Machinery and Chemical Corp.

CONTINUED

Sodium Desulfurization

accompanying table. These figures are for BTX mixtures. The same processes can be used to treat benzene-toluene, benzene alone, or toluene alone—at still lower operating costs.

Distillation Removes Many Impurities

While the whole crude light oil may be desulfurized with sodium, distillation prior to sodium treatment is a more economical method for removing many of the sulfur compounds and other impurities present. Thiophene, of course, cannot be removed economically by distillation. An acid wash prior to sodium treatment is also used frequently to lower the level of some impurities.

Since purity requirements are usually less critical for xylene than for benzene and toluene, it is generally considered preferable to separate xylene from BTX mixtures before sodium refining. This minimizes sodium consumption. If necessary, xylene can be purified by itself.

For further information, send for the new U.S.I. technical data bulletin "Desulfurization of Benzene, Toluene and Xylene by Sodium." Address Technical Literature Department, U.S.I. Chemical News, 99 Park Avenue, New York 16, New York.

For commercial-scale processes developed by U.S.I., and for their costs, U.S.I. can put interested parties in touch with engineering companies who have developed plant designs for these processes.

Process Good for Many Hydrocarbons

Sodium desulfurization has also been used successfully with other hydrocarbons such as naphthalene. U.S.I. researchers have broad experience with this process, and will be glad to work with interested companies.

New Extinguisher Quenches Three Types of Fires

For the first time in history, a fire extinguisher has been developed which will put out all types of fires, according to recent reports. The extinguisher is said to do an effective job of quenching the three principal kinds of fires—those in combustibles like paper and wood, those involving flammable liquids like gasoline, and those in electrical equipment.

It uses a non-caking and moisture-repellent dry chemical which expands into a rubbery mass when exposed to heat. This action tends to smother the fire.

Up to this time the many kinds of fire extinguishers have been able to handle one, and sometimes two, classes of fires, but never all three. While the new extinguisher is claimed effective on all three, it does not supplant other extinguishers which may have superior quenching powers on a particular type of fire.

Rapid Chemical Reactions Analyzed by Photoflash

By exposing various materials to billion-watt flashes of light that last only a millionth of a second, chemists have recently observed many of the short-lived substances that play key roles in photochemistry, it is reported. Called "flash photolysis," the new analytical technique has already revealed the details of important chemical processes in areas ranging from inorganic chemistry to biology.

The technique employs a microsecond flash of strong light to start the reaction. Then, after an interval of a hundred thousandth of a second or less, the mixture is analyzed spectroscopically by a fainter burst of light. In this way, intermediate products with a lifetime of only a few millionths of a second have been positively identified, according to the report.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Patented process for making organic microfibers now being licensed. In process, vinyls, acrylics, nylon, polyesters, asphalt, etc., are melted or dissolved and sprayed to form superfine fibers. Suggested for filters, other uses. **No. 1620**

Variable programming systems, for automation of chemical analyses and procedures in clinical and biochemistry, now on market. Units include indexing, transfer, storage, centrifuging, incubating, programming mechanisms. **No. 1621**

Corporate diagrams and administrative personnel of the chemical industry are presented in new, looseleaf edition of reference book now being sold. Supplement also supplied to keep information up-to-date. **No. 1622**

Counter-current, liquid-liquid extractors for complex solvent extraction are described in new bulletin now available. Extractors incorporate several mixing and separating stages in single bowl revolving at high speed. **No. 1623**

How ammonium nitrate behaves under fire conditions is covered in new article which can now be purchased at nominal price. Conditions necessary for explosion are detailed, as are fire-fighting procedures and storage methods. **No. 1624**

POLYMER, a new international quarterly devoted to science of large molecules, is now offered on paid subscription basis. Provides medium for publication of original papers on chemistry, physics, applications of polymer research. Includes publicity on papers to come. **No. 1625**

Technique for producing flame-resistant urethane foam of polyester type is described in new bulletin now available. Reveals that additions of tris (beta-chloroethyl) phosphate (TCEP) to foam mix controls burning rate. **No. 1626**

New, low-cost infrared spectrophotometer makes possible high-resolution runs in near-infrared wavelength region between .83μ and 7.65μ. Gives exact structural information on organics with C-O and O-H molecular configurations. **No. 1627**

Alkaline electrocleaner, containing chelating agents, has been introduced for heavy-duty anodic cleaning of heavily soiled steel which has enough smut, rust or oxides to defy complete cleaning in conventional electrocleaners. **No. 1628**

Tantalum and niobium metallurgy are subject of recent book which can now be purchased. Covers extraction, reduction, consolidation, working. Includes chapters on physical, chemical, mechanical properties; corrosion; alloys. **No. 1629**

PRODUCTS OF U.S.I.

HEAVY CHEMICALS

Sodium, Metallic: cast solid in tank cars, steel drums, pails; bricks in barrels, pails.
Caustic Soda, Chlorine
Phosphoric Acid, Fertilizer Grade
Ammonia, Anhydrous: commercial & refrigeration. Tank cars or tank trucks.
Ammonium Nitrate, Nitric Acid, Nitrogen Fertilizer Solutions
Sulfuric Acid: all strengths, 60° Baume to 40% Oleum. Also Electrolytic grade to Federal specifications. Tank cars or tank trucks.
Sodium Peroxide

OTHER PRODUCTS

PETROTHENE® Polyethylene Resins
MICROTHENE . . . Finely Divided Polyethylene Resin.

Pharmaceutical Products: DL-Methionine, N-Acetyl-DL-Methionine, Urethan USP, Intermediates.
Ethyl Alcohol: Pure and all denatured formulas; Anhydrous and Regular Proprietary Denatured Alcohol Solvents SOLOX®, FILMEX®, ANSOL® M, ANSOL PR.
Organic Solvents and Intermediates: Normal Butyl Alcohol, Amyl Alcohol, Fusel Oil, Ethyl Acetate, Normal Butyl Acetate, Diethyl Carbonate, DIATOL®, Diethyl Oxalate, Ethyl Ether, Acetone, Acetoacetanilide, Acetoacet-Ortho-Chloranilide, Acetoacet-Ortho-Toluidide, Ethyl Acetoacetate, Ethyl Benzoylacetate, Ethyl Chloroformate, Ethylene, Ethyl Sodium Oxalacetate, Sodium Ethylate, Urethan U.S.P. (Ethyl Carbamate), Riboflavin U.S.P.
Animal Feed Products: DL-Methionine, MOREA® Premix (to authorized mixer-distributors).

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corporation
99 Park Avenue, New York 16, N. Y.

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Market Newsletter

CHEMICAL WEEK
August 27, 1960

In the spotlight this week, cumene-phenol-caprolactam. One of the world's largest cumene plants went onstream at Texaco's Eagle Point facilities at Westville, N.J., last week. Capacity: about 70 million lbs./year. Behind the move: new phenol and caprolactam expansions by Allied Chemical. (Cumene-consuming phenol is a raw material for caprolactam.)

Allied is now nearing completion of an addition to its phenol plant at Frankfort, Pa. When completed, near mid-September, output potential of phenol will be about doubled, to 80 million lbs./year. While Allied's original raw material needs at Frankfort were supplied from captive cumene operations, the company decided to purchase the requirements for its latest expansion and entered into an agreement with Texaco. First cumene shipments from the Westville unit will be made this week.

Triggering both these moves is Allied's expanding caprolactam capacity, which will be used in the firm's nylon 6 polymer and fiber operations. This week Allied Chemical will start another addition to its caprolactam monomer operations at Hopewell, Va. When completed, about mid-'61, output potential will be increased about 75%.

Just last month, caprolactam capacity at Hopewell was boosted from 60 million lbs./year to 80-90 million lbs./year. With completion of the new unit, capacity will be raised to 140 million lbs./year.

Allied is also expanding its nylon 6 polymer units at Chesterfield, Va., which will almost triple existing capacity.

One major concern in the industry is the effect another 20 million lbs./year of acetone capacity (by-product of the cumene-phenol operations) will have on the market. Recent price softness dropped acetone tabs ½¢/lb., put the new tank-car listing at 8¢/lb.

•

There's more vinyl acetate monomer capacity this week. Pacific Carbide reports its Portland, Ore., plant is now in full production, running at the scheduled rate of 5 million lbs./year. Initial output is said to be going to the California market for formulation into paints and adhesives.

•

Goodrich Chemical's polyvinyl chloride plant at Long Beach (Watson), Calif., is reported to be onstream this week. Although capacity of the new plant is not revealed by the company, a good bet is 20 million lbs./year (*CW Acetylene Report, March 26, p. 47*). Monomer for the Goodrich unit is supplied by American Chemical's adjacent plant.

•

Cyanoethylated cellulose is finding new markets. Electroluminescent panels "five times brighter than any other now commercially available," developed by General Electric's Miniature Lamp Dept. (Cleveland), will reach retail counters in October. Key to the flexible, thin panels is

American Cyanamid's Cyanocel (*CW, May 28, p. 103*), a highly cyanoethylated cellulose having unusual electrical properties.

•

Plastics continues to make inroads into paper markets. Latest move is by Automatic Canteen Co., which is starting production of hot-and-cold polystyrene containers, for use in its vending machine operations.

The company recently formed a plastics division, which will handle production of a complete range of plastic products, including the hot-cold cups, ice cream and dairy containers. A unique in-line plastic cup machine, capable of turning out 30,000 plastic cups/hour has been developed.

•

Hydrogen fluoride demands in Canada will be increased, with the startup of Ontario's first hydrofluoric alkylation unit. HF is used as a catalyst in the process. The $3-million plant, which produces high-octane components for premium gasoline, is now in operation at British American Oil Co.'s Clarkson refinery near Toronto. Output will be about 3,000 bbls./day of alkylate.

•

In England, sodium silicofluoride capacity has been increased more than 50% by the recent startup of Imperial Chemical Industries' new plant at its Billingham Works. Output potential from ICI and the country's two other producers reportedly is now enough to satisfy U.K. demands.

•

Acrolein price cuts last week may provide the spark for expanding the uses of this versatile chemical. Carbide, only commercial producer at this time, has dropped tabs 15¢/lb., putting new quotes at 31¢/lb. in tank-car quantities (prices are f.o.b. works, sellers option, from Institute or South Charleston, W. Va.). Meanwhile, Shell, which is now completing its acrolein unit at Norco, La., declares it will be competitive when material starts rolling out of its plant later this year.

This is one of the first big price breaks on acrolein, and it appears that even lower quotes will be posted in the future. Prediction: within the next five years, prices will drop below 20¢/lb.

Current market for acrolein is estimated at 2-3 million lbs./year. Much of the output is used as an intermediate in the production of methionine, a feed supplement. Principal acrolein consumers are Du Pont and Monsanto (*CW Propylene Report, Nov. 14, '59, p. 66*).

Tabs on glutaraldehyde, an acrolein derivative, also were cut last week. The 28% drop is expected to stimulate commercial development of a tanning process recently developed by the U. S. Dept. of Agriculture (*CW, Nov. 28, '59, p. 77*), which uses glutaraldehyde as a sole-tanning agent.

The 6¢, across-the-board decrease was also initiated by Carbide, puts new quotes for the dialdehyde at 13¢/lb. in tank cars; 15¢/lb., truck load; 15.75¢/lb., l.c.l.

Does this success with PANAFLEX Plasticizer give you ideas?

PANAFLEX BN-1 Plasticizer is an outstanding extender plasticizer for vinyl wire and cable jacketing. Compounders regard PANAFLEX as their preferred plasticizer for this application for these reasons:

One: PANAFLEX has excellent electrical properties.

Two: PANAFLEX helps impart a smooth glossy finish to extruded material.

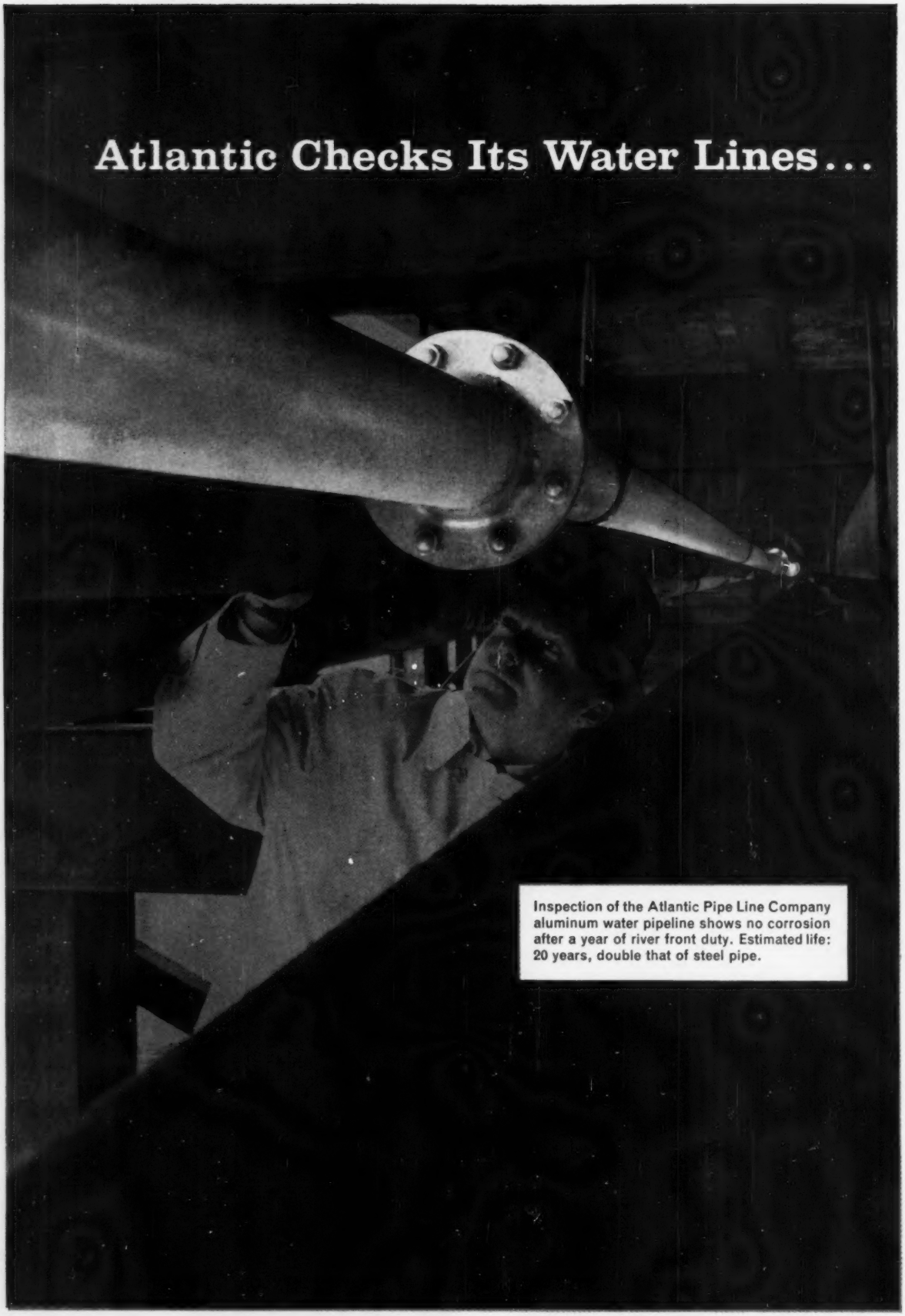
Three: PANAFLEX reduces costs. In large volume applications where a small reduction in cost per pound can mean big savings, PANAFLEX Plasticizer makes an important contribution to cost reduction while maintaining equal quality finished product.

Perhaps these product quality benefits suggest reasons why you should consider PANAFLEX Plasticizer for your formulations. Experienced plasticizer technical assistance is available from Amoco Chemicals to help you. Your inquiry will receive immediate attention.

AMOCO CHEMICALS

AMOCO CHEMICALS CORPORATION
910 South Michigan Avenue, Chicago 80, Illinois

Atlantic Checks Its Water Lines...



Inspection of the Atlantic Pipe Line Company aluminum water pipeline shows no corrosion after a year of river front duty. Estimated life: 20 years, double that of steel pipe.

...and estimates aluminum process pipe will last twice as long as steel in dock duty!

Aluminum pipe stays bright, clean, and strong. It collects no scale inside, permitting use of smaller diameter pipe. Light weight simplified installation, eliminated need for hoist.

In November, 1958, the Atlantic Pipe Line Company installed an aluminum pipeline to supply water to ships and barges near Philadelphia. This was the first aluminum water line the company had used; it was Reynolds 4" Schedule 40 Pipe.

A year later, Atlantic checked the pipe, and judging from its condition, estimated its life to be 20 years or more. Steel pipe in the same service lasts about 10 years.

The extra longevity of aluminum process pipe in this service is just one of several advantages it has provided. Because aluminum pipe will not scale or collect corrosion products, Atlantic could use 4-inch pipe, compared to a 6-inch diameter needed with steel pipe.

Easy installation is another advantage with lightweight aluminum pipe. Atlantic's pipeline was fabricated in the shop, and just two men installed it working from a single barge. Hoisting equipment is necessary to install equal lengths of steel pipe.

Finally, Atlantic enjoys considerable savings in maintenance with the Reynolds Aluminum Process Pipe. Where steel pipe needs painting every few years for protection against spray, rust, and brackish water corrosion, aluminum needs none at all. After a year of carrying drinking water along the river front, the aluminum pipe line showed no exterior corrosion.

Add up the advantages: longer service, easier installation, less corrosion, less maintenance. When you consider all the long-term factors, you have to consider aluminum process pipe.

For details on aluminum process pipe, or aluminum for any process application, contact your local Reynolds office, *or write Reynolds Metals Company, P.O. Box 2346-CM, Richmond 18, Virginia.*

REYNOLDS ALUMINUM

Watch Reynolds new TV show "Harrigan & Son", Fridays, starting October 7; also, "All Star Golf", Saturdays, resuming October 15—ABC-TV. And on Sunday, October 16, be sure to see the exclusive showing of America's new 1961 cars on The National Automobile Show, direct from Detroit over CBS-TV, 6 to 7 P.M. EDST.

SINGER

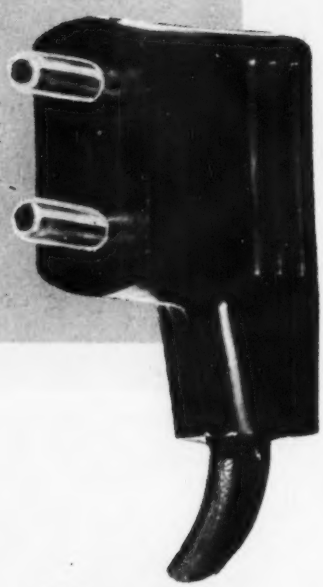
World-renowned Sewing Machines —

feature

BLACAR®

molded vinyl plugs!

The applications for top quality, electrical grade BLACAR compounds for molding (as well as extrusion) are virtually countless. A typical example of a special-purpose molding application is that employed by The Singer Manufacturing Co. — leading manufacturers of sewing machines — who rely on superior performing BLACAR UL-approved compounds for molding electrical plugs and insulating wire.



For this particular molding application, the specific requirements were met by **Cary's BLACAR Compound #3070** — providing: low molecular weight, exceptional clarity and color, uniform particle size, superior heat stability, unequalled electrical properties, etc.

There is a BLACAR Resin or Compound tailored for your particular end use — be it an extrusion, injection molding, or calendering application.

Learn what BLACAR can do for your products— write for technical assistance, working samples or data.

CARY CHEMICALS INC.

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VINYL RESINS — VINYL COPOLYMERS — VINYL COMPOUNDS — SPECIALTY WAXES — HIGH MELTING POINT SYNTHETIC WAXES

Pipeline pressure reduction is noisy, but leaded plastic material may help hush the din.

Proving Ground for Leaded Soundproofers

The aggrieved ears of Trenton, N.J., citizens — harried by a noisy pipeline—may get relief in the next few weeks from lead-containing plastics, an old-time material that's now finding new uses in acoustics control.

The Trenton case presents a formidable problem. In reducing the pipeline pressure of natural gas flowing in from Texas from 600 psi. to 200 psi., the Public Service Gas & Electric Co. (Newark, N.J.) ruefully finds that in the neighborhood of the Trenton converting station the line gives off a cacophony of whistles, screeches and roars. To solve the problem the firm is trying to find a method of noise abatement.

Inside track is held by Cordo Chemical Co. (Norwalk, Conn.), whose Coustifab, a lead-loaded vinyl, is top contender for the job. The leaded plastic would be wrapped around the pipes, cutting noise and vibration.

Coustifab is just one example of the increasing number of lead-containing plastic and synthetic rubber products being used for damping sound.

The Lead Industries Assn. estimates that 600,000-800,000 lbs./-year of lead is currently being consumed for these materials, expects a 10-fold jump by '65. Newly found applications are making deeper inroads every day into the acoustical market. And although the number of producers in the field are few so far, several big chemical firms are known to be researching similar products for possible entry into the market.

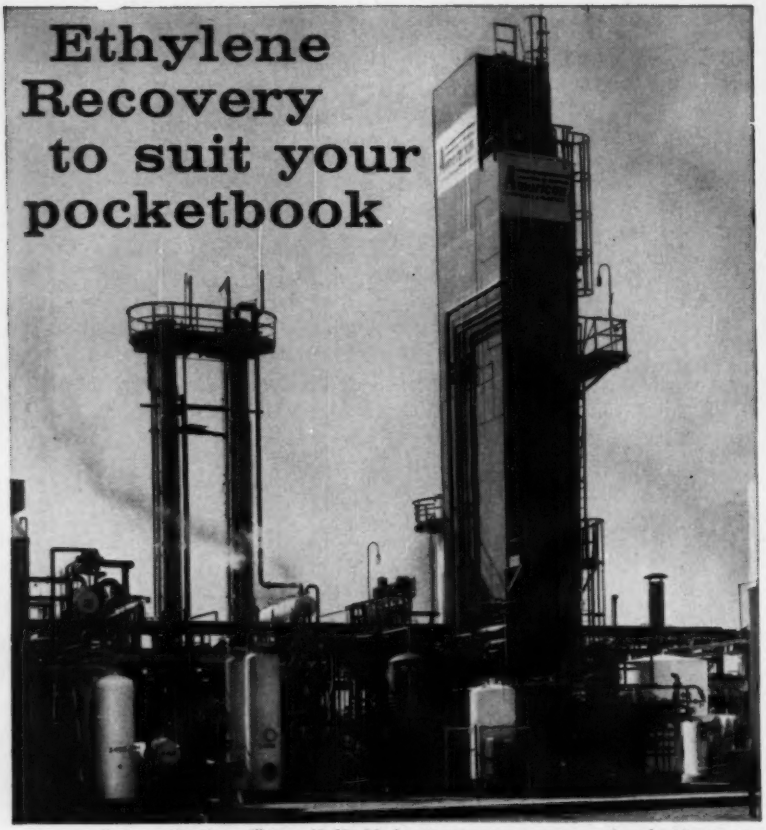
Mapping the Market: Leaded plastics are not new; they've been finding a market for 20 years as radiation (e.g., X-ray) shielding. But within the last year and a half, new end-uses have opened up in construction, aircraft, submarines and surface ships, machinery mounts, air-conditioning units, transformers, office machines.

Reason for success: the high sound absorbtion powers of lead, plus the flexibility of vinyl, make it much more effective and somewhat different than many conventional acoustical materials (tiles, felt, glass fiber) now on the market. Such materials, acting as a labyrinth, trap much of the sound, but by no means all of it. Leaded plastics, on the other hand, prevent sound from penetrating.

Big in Acoustics: Cordo's Coustifab is a lead powder dispersed in vinyl, and applied as a coat to woven glass or cotton duck fabric. It can be produced in a continuous roll or cast in slabs, and may be colored, embossed or printed. Formulation consists of about 20% vinyl, and 66-75% lead. It is backed with a special pressure-sensitive adhesive. Cost is 60¢ to $1.50/sq.ft., depending on the thickness.

About a year and a half ago the company began seeking uses for the material other than as X-ray shielding. One new customer is the Navy, which has found it effective for damping hull plates in ships. When applied to the inside of a hull, Coustifab prevents sonar equipment from vibrating. It's also used to soundproof

Ethylene Recovery to suit your pocketbook



An unusually large "packaged" type Air Liquide low-temperature gas separation plant in use at American Chemical Corporation's chlorinated-hydrocarbon manufacturing centre in California.

Lower capital outlay, elimination of over-production problems, and greater all-round design and operational flexibility. These are some of the positive advantages gained from the use of *low-temperature gas separation* in ethylene recovery.

Pioneered by Air Liquide, the low temperature process is ideally suited to the present trend of ethylene recovery by smaller capacity units. Low-temperature separation permits the building of smaller units, which result in lower erection and operation costs. Air Liquide designs and builds these smaller units as "pre-packaged" assemblies, with capacities up to 100 tons or more per day.

During the past 30 years, Air Liquide has been recovering ethylene from effluent gases like coke-oven gas (containing 1.5 to 2%) and refinery off-gases (containing 5 to 15%) by the low-temperature process. And Air Liquide has built more ethylene recovery units and hydrocarbon separation plants than anyone in the world.

If you are thinking of ethylene recovery, check first with American Air Liquide.

Air Liquide has designed and built the following types of plants, now in use throughout the world:

• Air Separation — oxygen, nitrogen, etc. • Tonnage Oxygen and Nitrogen (Gas and Liquid) • Rare Gases Recovery • CO_2 Purification • Methane Purification • Natural Gas Liquefaction • Coke-Oven Gas Separation • Refinery Gas Separation • Hydrogen Liquefaction • Helium Recovery • Pure CO Production • Heavy Water for Atomic Reactors

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In Canada: L'Air Liquide, 1210 Sherbrooke St. W., Montreal, Quebec. Telephone: Victor 2-5431

* ALL AIR LIQUIDE LOW-TEMPERATURE PLANTS ARE DESIGNED AND BUILT IN NORTH AMERICA FROM AMERICAN MATERIALS, TO NORTH AMERICAN STANDARDS

rooms containing sonar equipment.

Another market is in aircraft—e.g., ceilings and rear side panels of jets. Sikorsky selected the material last month for its helicopters, after finding it markedly reduces noise in cabins.

In the building trade, a possible use is for hotel and motel walls. Most walls are normally 5 to 6 in. thick, including plaster. Coustifab would reduce required wall thickness to 3 in., saving space. Partitions and folding doors are two more fields in which the material is just beginning to penetrate.

Among the companies now making use of the material: Carrier Corp., for air conditioners; General Electric, for transformers; Du Pont, for noise damping on compressors and motors.

Office machines (electric typewriters, computers, etc.) are said to be less noisy when constructed with Coustifab.

Other Entries: Bar-Ray Products, Inc. (Brooklyn, N.Y.), is now supplying a leaded vinyl similar to Coustifab as radiation shielding, hopes to get into the acoustical field shortly with Lead-X. The firm is currently doing preliminary testing with its sound-deadener in office machines, aircraft and air conditioners.

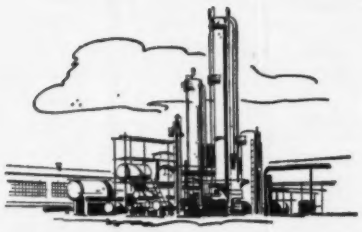
The Devcon Corp. (Danvers, Mass.) is marketing a leaded epoxy called Devcon L for sealing and bonding in the marine and maintenance fields. It's 94% lead powder and 6% epoxy resins, and can be cast without heat or pressure. It is reported to have good adherence to lead, aluminum, concrete, porcelain and a number of other materials. When it hardens it can be sawed or machined with ordinary tools. The putty is also said to be an effective shield against radioactive materials.

One casualty of the business is reported by Johnson & Johnson's Permacel Division (New Brunswick, N.J.), which was testing an acoustical material consisting of 70% fine lead powder with 30% isocyanate applied to a Mylar backing. Disappointing results caused the product to be dropped about two months ago.

Silicones are also now getting the lead treatment. Connecticut Hard Rubber Co. (New Haven, Conn.) for the last few months has been selling leaded silicone rubber, Cohrlastic

"COOLING WITH PURECO CO_2 LIQUID...

eliminated a major bottleneck"*



*This statement was contained in an engineer's report concerning the use of CO_2 as a coolant by a company that sulfunates straight chain alcohol. CO_2 sparged directly into the chemicals in the reaction tank, maintains a controlled temperature of -70° F or below. Total time for cooling *55 minutes . . . former time 3 to 4 hours.*

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New applications for Pureco CO_2 are being found constantly . . . new ways of doing things more efficiently and economically with this versatile chemical. The engineers in Pureco's Technical Service are highly trained in the application of its many uses . . . they are ready, willing and able to discuss, demonstrate or assist in the experimental development of CO_2 applications, whether they entail a new use for the product or the improvement of an existing one.

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- CHEMICAL PRODUCTION
- LION TAMING
- DETERGENT MANUFACTURE
- GLASS and CERAMICS
- PAINTS and PIGMENTS
- CEMENT and MORTAR
- PHARMACEUTICALS
- PULP and PAPER MAKING
- RUBBER
- BASKETWEAVING
- TEXTILES
- WATER TREATMENT

As far as we know, only lion tamers and basketweavers don't use much Nalco 680 sodium aluminate. All the other industries listed do. So do many others. Nalco 680, a low-cost source of high purity alumina, offers many advantages as a chemical intermediate, including:

High alumina content—average 46% Al_2O_3.
Excellent stability—careful production processes, plus special stabilizers, maintain high stability while retaining an optimum Na_2O/Al_2O_3 molecular ratio of 1.15/1.
Purity—iron content is approximately .01 per cent; silicon, .02 per cent; and only trace levels of calcium, magnesium, and tin.
Low corrosivity—Nalco 680 sodium aluminate solutions are alkaline, making stainless steel or rubber/plastic/lead lined equipment unnecessary. Also, when Nalco 680 is used with alum to produce alumina, NaOH from the sodium aluminate reduces alum-produced sulfuric acid.
Multiplicity of uses—Nalco 680 is a chemical intermediate of many uses. Some of the many compounds which can be made from 680 are: aluminum stearate, aluminum acetate, free alumina, acid alumina sols, aluminum hydroxide, paint gels, aluminum hydrates, and aluminosilicate zeolites.
Handling/shipping ease—Nalco 680 is easily and rapidly dissolved in water. Its high concentration means that less 680 is needed per process, saving warehouse space and reducing shipping expense.

The foregoing is only a brief description of the uses and advantages of Nalco 680 sodium aluminate. For complete information write for a copy of Nalco Bulletin K4. Or, call your local Nalco field representative.
Even if you weave baskets or tame lions, you may find a use for Nalco 680—researchers are finding so many new uses for it that we'd be reluctant to say definitely that there's any industry or process in which it can't be used in some way.

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Nalco CHEMICALS

HG, for radiation and acoustical use. It is said to provide uniform shielding against high-energy radiation, has a high specific gravity, good resiliency qualities, and can be molded or extruded, or coated on fabrics. The company, looking toward the military, sees a worthy potential market in missiles and outer-space aircraft.

And a radiation shield of paraffin and lead has been investigated by California Ink Co. (Berkeley, Calif.). Originally developed by the University of California's radiation laboratory, it's made of granulated lead in a paraffin wax base, is lighter and considerably cheaper than solid lead (*CW Technology Newsletter, July 13, '57*).

Neoprene Gets into Act: Within the past year the Navy has also started using lead-containing neoprene as a sound-damper on submarines—both nuclear and conventional. Exterior areas of the nuclear-powered *Triton* and *Skipjack* are swathed in a fabricated neoprene sheathing containing loose lead shot, which damps sound, serves as an antiturbulence and antifouling coating.

Main producer of the material is Irving B. Moore Co. (Boston), which also supplies it to commercial shipping manufacturers.

Chemical Coatings & Engineering Co. (Media, Pa.) has been handling leaded neoprene for acoustic uses about two years. It sells Corrocote neoprene and leaded isocyanate coatings, putties, and foams.

Missile-Age Materials: Right now the market for leaded materials is still undeveloped. Because price of the material is relatively high, biggest customer is the military, although manufacturers of appliances are considering the sound-reducing aspects of the material.

Washing machine makers, for example, have found that vibration and noise is practically non-existent when a machine is lined with a leaded plastic. And even a few cents worth of the material, strategically placed, reduces noticeably noise.

But in view of the rapid growth of the business in the past year, and the potential of lead-containing materials in missiles, nuclear vessels, and aircraft—as well as a roster of civilian uses—leaded plastic and neoprene are decidedly a potential market on the move.

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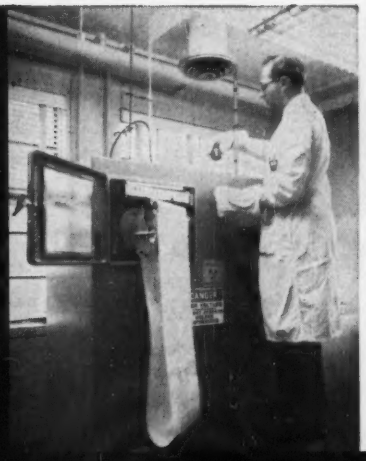

Up-to-date scientific equipment, like this gas chromatography instrument, at Ultra Chemical's Paterson laboratory, is extremely useful in ferreting out the causes of customers' processing problems, and contributing to their solution.

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LUMMUS

ENGINEERS AND CONSTRUCTORS FOR INDUSTRY

NEW SHELL PROCESS ETHYLENE-OXIDE PLANT TO GO ON STREAM FOR OLIN MATHIESON IN 1960

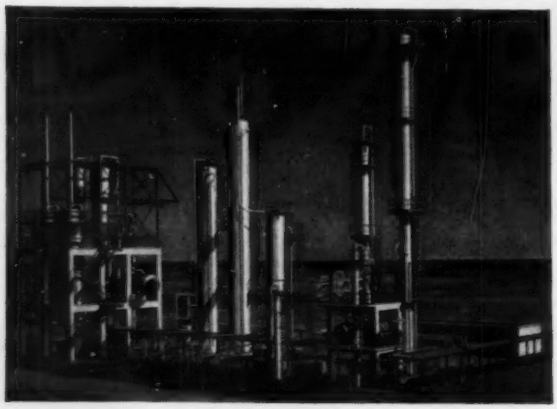
Olin Mathieson Chemical Corporation's new ethylene oxide plant at their Doe Run works, at Brandenburg, Kentucky is scheduled to go on stream late in 1960.

Engineered and constructed by The Lummus Company, the plant will employ the Shell Development Company's process for the direct oxidation of ethylene to ethylene oxide. The ethylene oxide product will be converted into derivatives for use in the manufacture of antifreeze, industrial coolants, hydraulic brake fluids, detergents and chemical intermediates.

Feed for the new plant will come from Olin Mathieson's ethylene plant, also located at Doe Run.

The new plant is part of a recently announced $30 million expansion program for Olin Mathieson's Chemicals Division. It is the fourth Shell process ethylene-oxide plant to be designed, engineered and constructed by Lummus in the last several years. The other three are operated by Calcasieu Chemical Corporation, at Lake Charles, La.; Wyandotte Chemical Corporation at Geismar, La.; and Petrochemicals, Ltd. at Partington, England.

For ethylene oxide and ethylene glycol, or for any type of chemical or petrochemical plant, Lummus' half century of world-wide experience on more than 850 plants for the process industries is at your disposal.



'SHELL' HDS UNIT FOR KOPPARTRANS OLJEAKTIEBOLAG

This Catalytic Desulfurisation Unit for treating 8000 BSD of Catformer feedstock is the latest addition by Lummus to the modern processing facilities at Koppartrans' Gothenburg Refinery. It utilizes the 'Shell' Vapor Phase Catalytic Process and provides the high quality low sulfur naphtha required for the ultimate production of high octane gasoline. Lummus has engineered and built a large number of similar hydrodesulfurisation plants all over the world. This is the latest in Europe. Lummus installed the successful prototype unit for Shell at their Stanlow Refinery in England.

B^2R^2

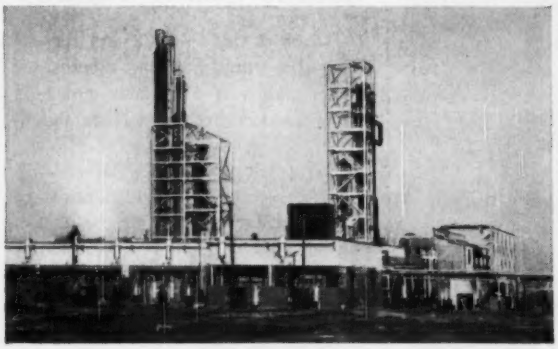
AEC Selects Lummus for Architect-Engineering and Construction Services on $10 Million High Flux Beam Research Reactor

The Atomic Energy Commission has selected The Lummus Company for architect-engineering and construction services on a proposed $10 million research reactor.

At the time of the selection, the A.E.C. said it had chosen the Lummus proposal as a basis for contract negotiations for a 20,000-thermal kilowatt, high-flux reactor. The installation will be built at the A.E.C.'s Brookhaven National Laboratory in Upton, N.Y. Curtiss-Wright Corporation will serve as the nuclear engineering subcontractor to The Lummus Company.

The reactor, authorized by Congress, will produce a high neutron flux – that is, a high intensity of neutrons. It will be used for such research projects as: studying the composition of solid materials, producing isotopes, and research on nuclear particles.

Ethylene Plant Expansion on Stream for Canadian Industries Limited



LUMMUS DESIGNS AND ENGINEERS 85% EXPANSION OF ETHYLENE PLANT AT EDMONTON, ALBERTA, CANADA

Expansion of C-I-L's ethylene facilities at Edmonton, Alberta, Canada, is completed and the plant now has a capacity of 46 million lbs. per year of high purity ethylene. The entire output of this unit is used by C-I-L to manufacture polyethylene.

Lummus designed and engineered the expansion of the existing cracking facilities, built in 1953, for the increased production of ethylene, and the ethane recovery unit for extracting ethane from natural gas.

As originally designed, the plant recovered ethylene from the cracking heater effluent and ethane from natural gas by oil absorption. In the expanded plant, additional capacity is obtained by withdrawing the natural gas portion and increasing the heater effluent.

The new low temperature ethane recovery plant has a demethanization unit which utilizes ethylene refrigeration to temperatures as low as –145°F. At C-I-L's request sufficient capacity has been designed into this unit to permit another expansion step in the future.

Up-to-date equipment was employed to ensure economical and efficient operation. Special efforts were made, wherever possible, to incorporate existing equipment into the expanded plant.

In addition to the C-I-L expansion project, Lummus has designed 13 complete ethylene plants, with a combined total capacity of over one billion pounds per year.

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Here is just a partial list of chemicals for which Lummus has designed, engineered or constructed plants:

Acetone	Dichlorethane	Nitric acid
Acrolein	Dichlorobenzene	Phenol
Allethrin	Di-isobutyl alcohol	Phthalic anhydride
Ammonia	Ethylbenzene	Polyvinyl alcohol
Ammonium nitrate	Ethyl chloride	Polyvinyl pyrrolidone
Ammonium sulfate	Ethylene	Propargyl alcohol
Benzol	Ethylene glycol	Propylene
Beryllium metal	Ethylene oxide	Pyrrolidone
Bisphenol	Epon® resin	Styrene
Butadiene	Formaldehyde	Sulfuric acid
Butanediol	Heavy water	Surfactants
Butynediol	Hydrogen	Tetramer
Butyrolactone	Hydrogen sulfide	Trichlorethylene
Carbon black	Isopropyl alcohol	Trichlorobenzene
Caustic soda	Lamp black	Toluene
Chlorobenzene	Magnesium sulfate	Uranium oxide
Cumene	Mercuric nitrate	Vinyl acetate
Di-ammonium phosphate	Naphthalene	Vinyl pyrrolidone

Discuss your next chemical or petrochemical project with a Lummus representative.

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, N. Y.; Houston, Washington, D. C.; Montreal, London, Paris, The Hague, Madrid. Engineering Development Center: Newark, N. J.

Lummus Appoints General Creasy To Head New York Division

DR. S. Z. AVEDIKIAN SUCCEEDS CREASY AS DIRECTOR OF ENGINEERING DEVELOPMENT CENTER

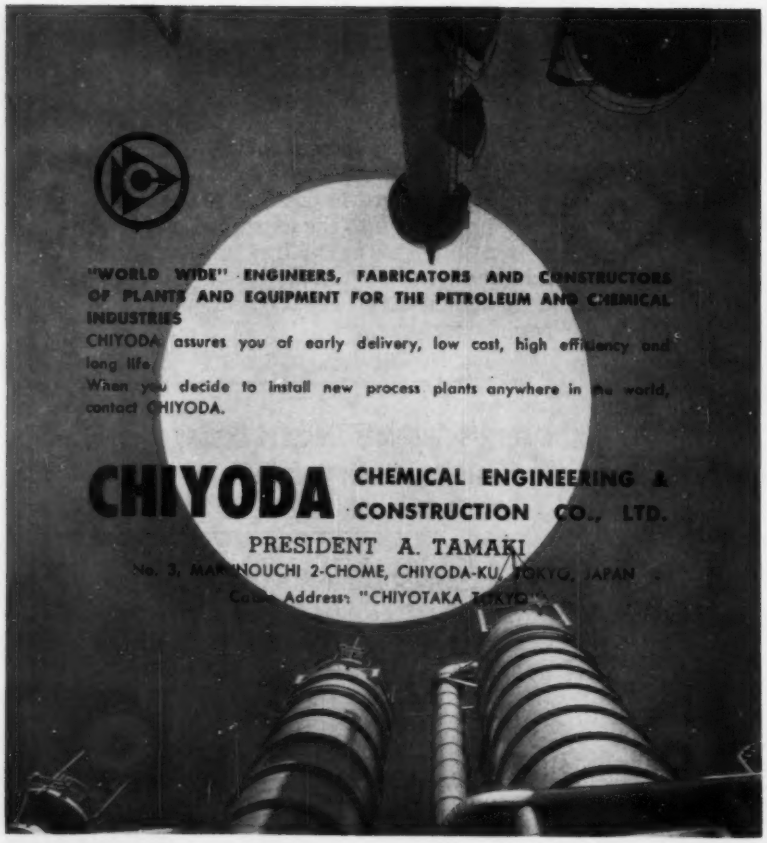
Major General William M. Creasy (U.S. Army retired) — who has been appointed to head Lummus New York Division.

William M. Creasy—Major General, U.S. Army retired – a Vice President of The Lummus Company, has been appointed to head the company's New York Division. At the same time, Dr. S. Z. Avedikian is joining The Lummus Company as Director of the Engineering Development Center in Newark, New Jersey. He succeeds General Creasy, who was formerly Director of the Engineering Development Center.

Previous to joining Lummus in 1958, General Creasy had served as Chief Chemical Officer of the Army since 1954. In this position, he was in charge of the Army Chemical Corps, whose activities include large-scale research and development, engineering, training and procurement in chemical, biological and radiological warfare. General Creasy received his B.S. degree from the United States Military Academy in 1926, and an M.S. degree in Chemical Engineering Practice from M.I.T. in 1936.

Dr. S. Z. Avedikian—Appointed Director of Lummus Engineering Development Center.

Before joining Lummus, Dr. Souren Z. Avedikian of Princeton, New Jersey, was co-founder of Avedikian and Company in 1932, Tidings Corporation of America in 1947, and S. Z. Avedikian & Associates in 1959. Holder of about 30 U.S. and foreign patents, Dr. Avedikian has been engaged in the research and development of processes and products for over 25 years, concentrating in heavy and fine chemicals, plastics, textiles, pharmaceuticals, paper, food processing, and amalgam cells.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Tiffany Tames Tarnish

Tiffany & Co. (New York) has developed a tranishproofing process for silver, claims it eliminates polishing and preserves sterling surface indefinitely.

The development is explained as a "chemical process that deposits a translucent layer of film on the objects without altering their appearance." The coating is said to resist salt, sulfur, acetic acid and heat, and will not chip or peel. It is said to be damaged only by scratching.

Tiffany hasn't patented the process, won't say exactly what it is. Possibility: a monomolecular film of calcium fluoride, such as has been used for many years to coat glass components of various optical equipment.

The new coating, to be used on hollow ware, will be applied on all newly purchased silver—if customers want it (price of the treated silver would be about 10% over the regular price). Tiffany says that next year it will offer to apply the coating to silver it has sold in the past.

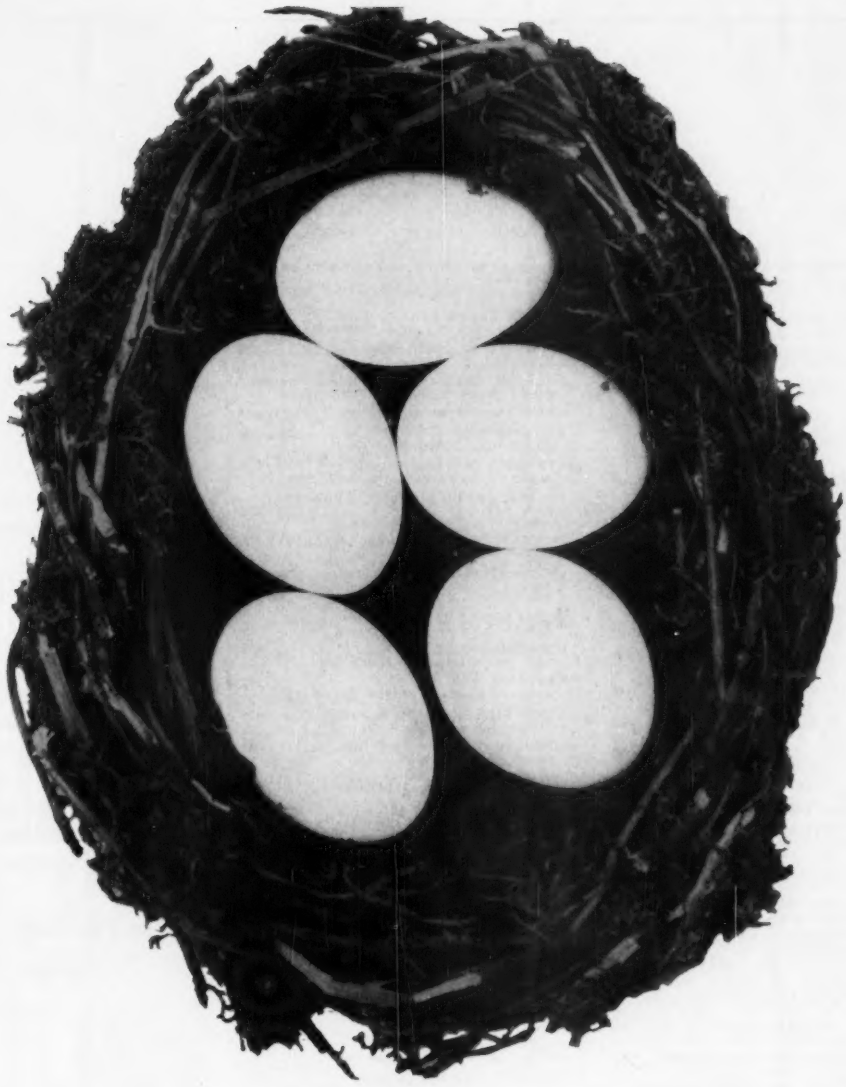
The firm also markets a private-brand silver polish—for customers who don't buy the tarnishproofed hollow ware.

PRODUCTS

Feminine Aerosol: Radar-Medical (Rome, Italy) is marketing Intimina Spray, the first vaginal pharmaceutical packaged in an aerosol. The package uses a standard glass bottle valve made by The Risdon Manufacturing Co. (Naugatuck, Conn.). The product is released as a foam when the specially designed applicator is pressed sidewards.

•

Plastic Coating: A sprayable coating of Penton (chlorinated polyether polymer developed by Hercules Powder) in water-suspension has been introduced by Pfaudler Permutit Inc. (Rochester, N.Y.) under the tradename Pfaudlon. The coating, which is applied by standard spray equipment then heated at 400-500 F, can be put on in thicknesses up to 40 mils with two applications. Pfaudler has licensed three firms to apply the coating: American Durafilm Co. (Boston), Mercer Rubber Co. (New York) and Electrochemical Engineering and Mfg. (Emmaus, Pa.).



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Product Development—Chemist experienced in research and development in the pharmaceutical field. News division of national company being expanded. Outstanding growth opportunity. Location Gulf South. Send resume to P-4978, Chemical Week.

High Temp Plastics Engineer: To develop and apply high-temperature ablative plastic materials similar to those used for nose cones or rocket nozzles. Background in resin chemistry with experience in glass, asbestos, refrasil materials desirable. Knowledge of fabrication techniques also desirable. Call R. J. Theibert collect at IVanhoe 1-7500. Tapco Group—Thompson Ramo Wooldridge Inc. 23555 Euclid Avenue, Cleveland 17, Ohio.

Applications Engineering, Organic And Physical Chemistry. Varian Associates Instrument Division is hiring Field Applications Engineers for new district sales offices in the New York and Chicago areas. These Engineers will develop applications and maintain sales contacts for magnetic resonance spectrometers. They will communicate with the prospective customer at a high technical level and will be expected to take an interest in the customer's particular problem for its own sake. A strong background in organic and physical chemistry and some experience in instrumentation and basic physics will be required. Sales experience is desired but not essential. Training in magnetic resonance spectroscopy will be provided in the Palo Alto, California laboratories. Considerable travel is involved. Interviews will be held in the East on September 10 through 20, 1960. For an appointment call collect to Varian Associates in Palo Alto, California, DAvenport 6-4000, Ext. 2547.

Experienced Paint Chemist Wanted to take full charge of paint laboratory of medium size Eastern manufacturer making complete line of chemical-resistant coatings; must also be able to do development work. Excellent opportunity for advancement. Send complete resume on educational background and previous experience, includ photo, and indicate salary requirements. P-5108, Chemical Week.

Manager Sales—Service—New position with growth company in organic chemicals. Responsibilities will include market research technical literature preparation, advertising, and liaison with distributors. Age no bar. Send complete confidential resume including salary requirements to L. F. Loutrel, Jr., Maumee Chemical Company, 1310 Expressway Drive, Toledo 8, Ohio.

POSITION WANTED

Plastics Engineer, M.S. ChE. Ten years thermo- plastics experience including extrusion of film and profiles, compounding, and scrap recovery. Wants responsible position. State salary range. PW-5124, Chemical Week.

SELLING OPPORTUNITY WANTED

Manufacturers Agent For Southwest, experienced technical sales staff now selling to Chemical, Food, Paper, Refineries, Oil and Gas Plants in Texas, La., Okla. and Ark. needs additional lines. Can we represent your product in this area? Engineers & Contractors, P.O. Box 7107, Houston 8, Texas.

PROFESSIONAL SERVICES

Clark Microanalytical Laboratory—CH, N, S, Halogen, Flourine, Oxygen, Alkoxyl, Alkimide, Acetyl, Terminal Methyl, etc. by specialist in organic microchemical analysis. P.O. Box 17, Urbana, Ill., Empire 7-8406.

CONTRACT WORK WANTED

Custom Grinding-Ultra Fine or Coarse-Specialty or Volume Blending and Grinding service on unit or contract basis. Complete CO_2 installation for Nylon, Teflon and Heat Sensitive Materials. A Cramer Corp., 10881 S. Central Avenue, Box 682, Oak Lawn, Illinois.

EQUIPMENT FOR SALE

Closing Out Chemical Plant at Orange, Texas type 316 st. st. equipment. Send for latest circular. Perry 1415 N. 6th St. Phila. 22, Pa.

Reaction kettles—Synthetic Resin Units 1-18,000 lb. charge stainless with agitator coils condensers, etc. including new "Selas" gas heating unit. 1-18,000 lb. charge stainless with agitator coils, condensers, etc. heated by a "Trent" electric jacket. 1-10,000 lb. charge stainless with agitator coils, condensers, receiver etc. jacketed for "Arochlor" electric heater. All kettles in equal to new condition and being replaced by larger units by new resin manufacturer. FS-5027, Chemical Week.

Chemical tank trailers, stainless steel, rubber- lined, pressure all types for sale or lease. Hackett Tank Company, Inc., 541 South 10th Street, Kansas City, Kansas. Phone: Mayfair 1-2363.

For Sale—Good Condition Barber-Greene Model 832 Rotary Dryer. The Cleveland Quarries Co., Amherst, Ohio.

Mojonnier 1550 Sq. Ft. Stainless Triple Effect evaporator, with preheaters, finishing pan, etc. Perry, 1415 N. Sixth St., Phila. 22, Pa.

Buflovak 5' x 30' Rotary Vacuum Dryer, T316 SS, jkt., ASME, late model, complete. Perry Equipment Corp., 1415 N. 6th St., Phila. 22, Pa.

Struthers Wells 3500 gal. T316 SS jacketed reactor, agit., int. coils. Perry Equipment Corp., 1415 N. Sixth St., Phila. 22, Pa.

CHEMICALS FOR SALE

60 Lypks. Aluminum Stearate 32¢ lb. Bulk DOS Plast. 32¢/lb. (dark). Bulk DBS Plast. 33¢/lb. w/w. Bulk Acetone Redistilled 43¢/gal. FS 4980, Chemical Week.

EQUIPMENT WANTED

Wanted: Any quantity of 55 gallon I.C.C. Stainless Steel Drums. W-4969, Chemical Week.

Dryer—Continuous Apron Conveyor type. Total drying area approx. 250 sq. ft. Apron construction, stainless steel. Hammer Mill—#3 Mikro or equivalent. Mixer—Double arm, blade tilting type. 300 gal. working capacity. Steam jacketed. 40 H.P. Stainless steel construction. Rotary Air Locks—8"—12". Ball Mill—6' x 10' Jacketed. Chrome Manganese Steel. Stainless Reactor—Min. size 6'6" x 8'. Must be built for 100 PSI pressure. 3 Stainless Steel Condensers—200 to 400 sq. ft. of tube surface. Please include price information with full particulars in the first letter. Indicate if you own the equip. and where it is available for inspection. W-5025, Chemical Week.

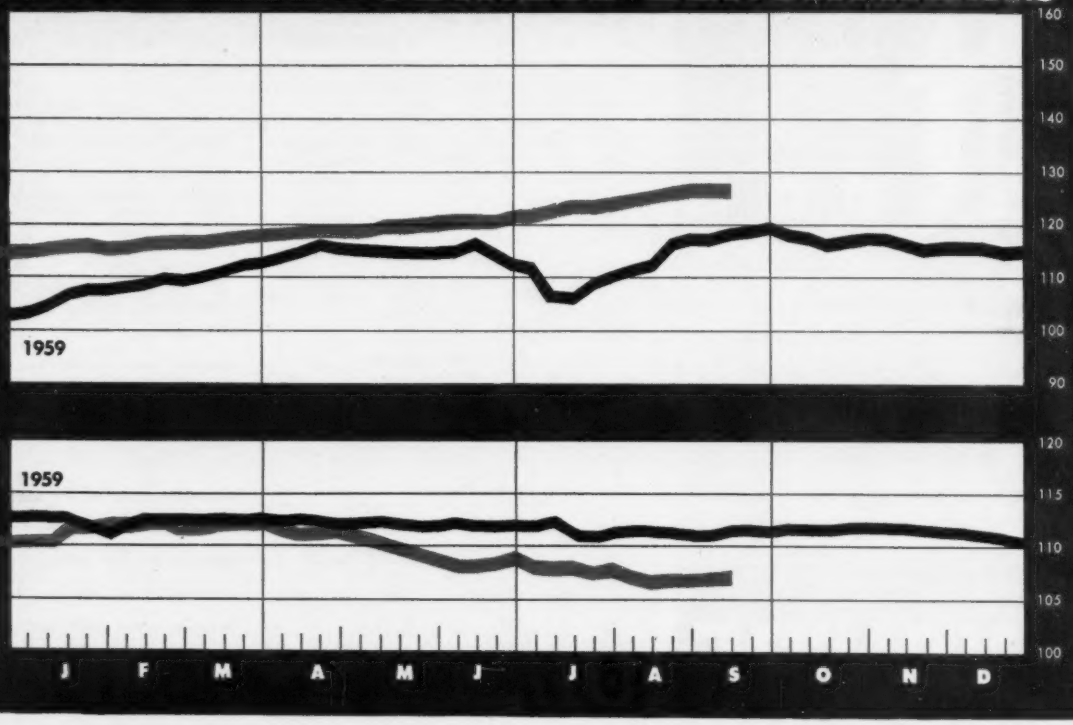
CHEMICALS WANTED

Anti-Bacterial Textile Finish—must withstand repeated machine launderings. Oil-Stain Resistant textile Chemical—durable to washing and dry-cleaning. W-5038, Chemical Week.

MISCELLANEOUS

To Employers Who Advertise for Men: The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered. When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. (Others do not receive the slightest indication that their letters have even been received, much less given any consideration.) These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide. We can guarantee that Every Advertisement Printed Is Duly Authorized. Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes. We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements. Classified Advertising Division, McGraw-Hill Publishing Company. "Put Yourself in the Place of the Other Fellow."

BUSINESS BENCHMARKS



AUGUST 27, 1960

WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Chemical Week output index (1957=100)	125.5	126.0	117.1
Chemical Week wholesale price index (1947=100)	108.0	107.5	110.7
Stock price index (12 firms, Standard & Poor's)	48.64	47.96	59.13
Steel ingot output (thousand tons)	1,589	1,525	321
Electric power (million kilowatt-hours)	14,622	14,709	13,648
Crude oil and condensate (daily av., thousand bbls.)	6,834	6,837	6,766

WHOLESALE PRICE INDICATORS (1947-49=100)	*Latest Month*	*Preceding Month*	*Year Ago*
All commodities (other than farm and foods)	128.2	128.2	128.4
Chemicals and allied products	110.4	110.2	109.9
Industrial chemicals	124.7	124.6	123.9
Paint and paint materials	119.3	119.1	118.4
Drugs, pharmaceuticals and cosmetics	95.1	95.1	93.5
Fats and oils (inedible)	47.7	47.9	55.3
Fertilizer and materials	110.6	108.8	107.4

CHEMICAL CUSTOMERS CLOSE-UP

FACTORY SALES OF PASSENGER CARS

MANUFACTURERS' SALES OF TEXTILES

GULF . . . AND THE REMARKABLE PROGRESS OF PETROCHEMICALS

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IN ASTRONAUTICS . . .

The avenues to outer space are paved with products from the earth's rich natural resources. Today rocket propellants get their thrust from petroleum hydrocarbons combined with liquid oxygen. And tomorrow from polystyrene-butadiene polymers, butyl rubber, resins and nitroglycerin compositions. Heat-resistant phenolic plastics hurtle through the ionosphere as nose cones, rocket fins, body panels. And as man himself takes his first tentative steps into space, the need grows for high-temperature transparent plastics for use in cockpits, portholes and windows. Someday, the astronaut will be able to leave his ship in outer space, in a pressure suit of nylon and neoprene.

Many of the answers to interplanetary travel have been found through chemistry. Still hundreds more—perhaps thousands—must be found. If you have made this your challenge, Gulf would like to supply you with the pure, high quality petrochemicals you need. For further details, write Petrochemicals Department Sales Office, Gulf Oil Corporation, 360 Lexington Avenue, New York 17, New York.

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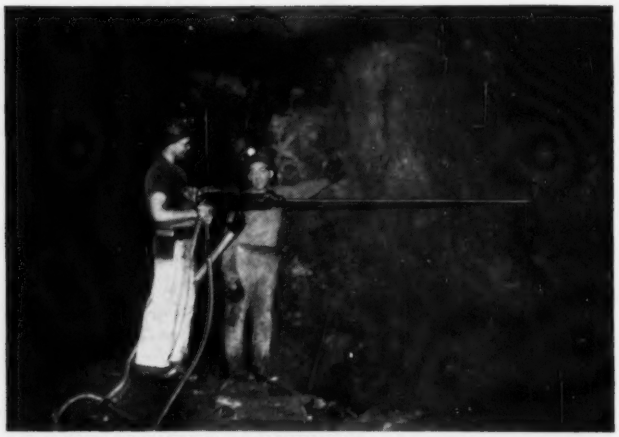

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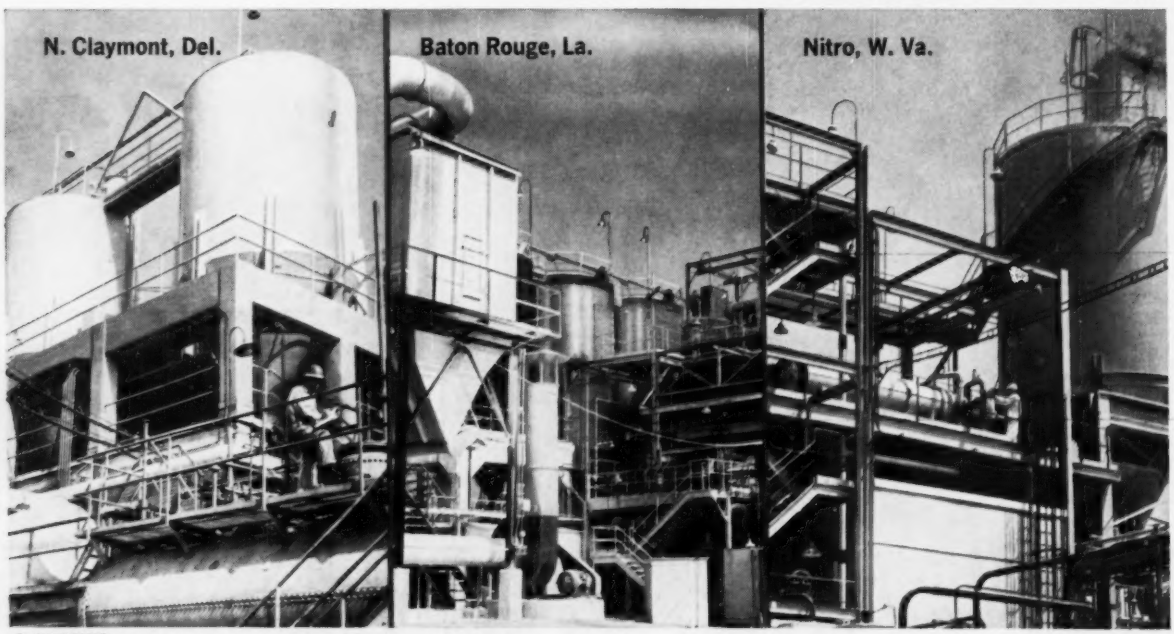

3 PLANTS. General Chemical produces anhydrous and aqueous hydrofluoric acid at the following three locations: North Claymont, Delaware; Nitro, West Virginia; and Baton Rouge, Louisiana.

5 STOCK POINTS. General has five bulk storage and packing stations in the United States for aqueous HF. Each backs up the others—assuring availability and prompt service at all times.

With its outstanding resources for essential raw materials—fluorspar reserves, mines and mills—plus a broad network of 18 sulfuric acid plants, General Chemical's *basic* position in hydrofluoric acid production is unmatched.

What's more, General is the *only* supplier offering shipment of hydrofluoric acid from more than one producing location. It supplies *anhydrous* and *aqueous* HF to its customers from *three* producing works and *aqueous* HF from an additional *five* company-owned locations.

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